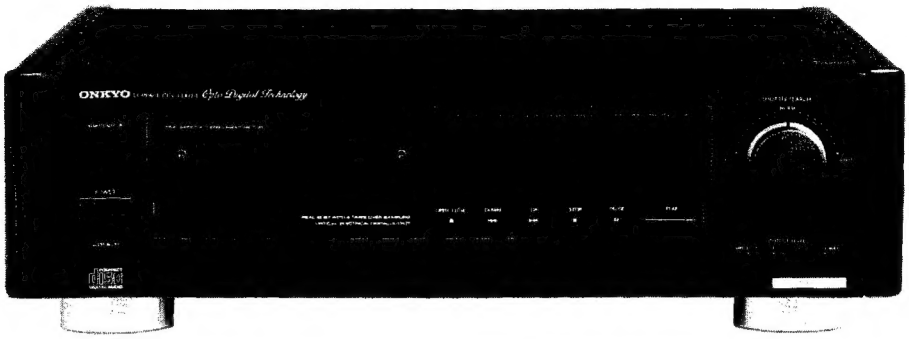
ONKYO® SERVICE MANUAL

COMPACT DISC PLAYER
MODEL DX-6990



Black model

Y-RELATED COMPONENT WARNING!!

ENTS IDENTIFIED BY MARK ⚠ ON THE TIC DIAGRAM AND IN THE PARTS LIST ARE L FOR RISK OF FIRE AND ELECTRIC SHOCK. E THESE COMPONENTS WITH ONKYO PARTS ART NUMBERS APPEAR AS SHOWN IN THIS ..

EAKAGE-CURRENT OR RESISTANCE MEA-NTS TO DETERMINE THAT EXPOSED PARTS CEPTABLY INSULATED FROM THE SUPPLY BEFORE RETURNING THE APPLIANCE TO TOMER.

SPECIFICATIONS

Signal readout system:	Optical non-contact
Reading rotation:	About 500~200 r.p.m. (constant linear velocity)
Linear velocity:	1.2~1.4m/s
Error correction system:	Cross interleave readsolomon code
Decoded bits:	18 bits linear
Sampling frequency:	352.8kHz (8 times oversampling)
Number of channels:	2 (stereo)
Frequency response:	2Hz~20kHz
Total harmonic distortion:	0.0015% (at 1kHz)
Dynamic range:	103dB
Signal to noise ratio:	110dB
Channel separation:	103dB (at 1kHz)
Wow and Flutter:	Below threshold of measurability
Power comsumption:	24 watts
Output level.	2 volts r.m.s.
Dimensions (W x H x D):	477 x 142 x 427mm 18-3/4" x 5-9/16" x 16-13/16"
Weight:	27kg, 59.5 lbs.

Specifications are subject to change without notice.

ONKYO
IDIO COMPONENTS

E OF CONTENTS

CE PROCEDURES

Release the Transport Lock

ect the optical assembly including the laser from vibration related damage during ship- s unit is equipped with a transport lock lever ɔn the base.

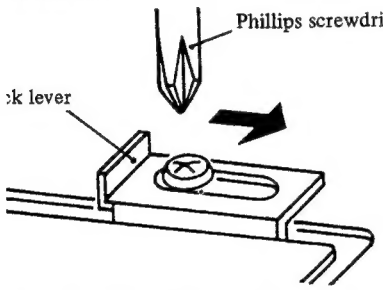


Fig. 1

en the screws with a Phillips screwdriver.
the lock lever in the direction of the arrow as it will go.
en the screw to secure the lock lever.
ɔr shipping, restore the lock lever to its posi- ɔn in the opposite direction from the arrow, en tighten down the screw to secure the lock ver in that position.

es for replacement of flat packaged ICs to be used:

lering iron . . . . Grounded soldering iron or soldering iron with leak resistance of 10 Mohms or more.

of soldering iron's tip:

Fig. 2

ifying glass . . . for checking of finished works

zers . . . . . for handling of IC and forming of leads

(4) **Grounding ring** . . . . Countermeasure for electro-static breakdown
(5) **Nipper** . . . . . for removing defective IC
(6) **Small brush** . . . . . for application of flux
(7) **Enamel line**

2. Work Procedures:

(1) Remove the defective IC

Cut all leads of the defective IC one by one using a nipper and remove the IC.

1. An enamel line has been pierced between the legs of the flat package IC.
2. Use a soldering iron to unsolder the legs one at a time.
3. Repeat the procedure of 1 and 2 above for the 3 sides only.

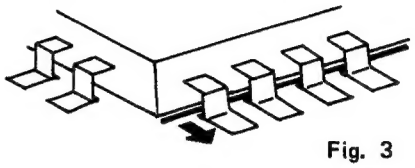


Fig. 3

While holding the soldering against the enamel line, pull in the direction of the arrow.

(2) Clean the pattern surface of the PC board.

Get rid of the remaining leads and solder.

(3) Check and from the leads of the new flat packaged IC to be installed.

From every lead on the new IC using a pair of tweezers, so that all of them are aligned neatly without being risen, twisted or inclined toward one side. Especially the rising portion of every lead must be formed with greatest care.

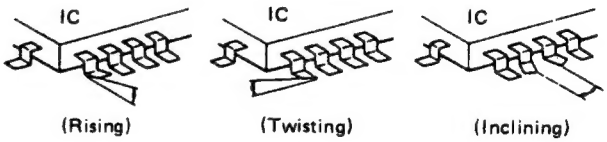


Fig. 4

(4) Apply flux to the PC board.

Apply flux to the pattern surface of the PC board which has been cleaned, as shown in the illustration. The area to be applied with flux is the portion of about 2.5mm in width where the IC's leads are to be soldered.

Be careful to apply minimum amount of flux required so as not to smear it on unwanted areas.

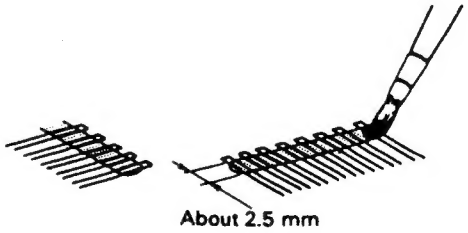


Fig. 5

:fully align the pattern and IC's leads, so that IC will be temporarily tightened to the pattern the four leads at the corners. At this time, sol- ng is required, but no need to apply soldering erial.

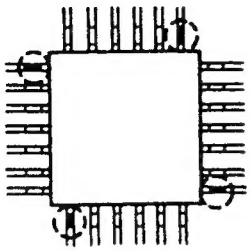


Fig. 6

ply flux to IC's leads

ply flux to the areas of IC's leads where soldering o be performed. Be careful not to smear flux on root portion of any lead or the body of IC.

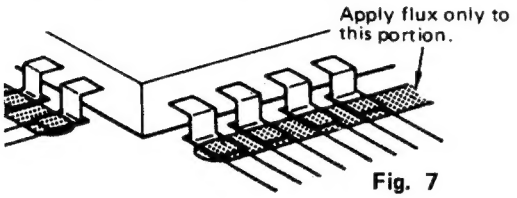


Fig. 7

While attaching the tip of the soldering iron to the soldering point as shown in the illustration, feed 2 –5mm of soldering wire. Then, slowly move the iron in the direction indicated by the arrow in the illustration, so that the leads will be soldered to the pattern. Move the iron in the rate of approximately 1cm in 5sec. Proceed with your work while confirming a clean fillet of solder is formed on each lead, subsequent to the melting of flux.

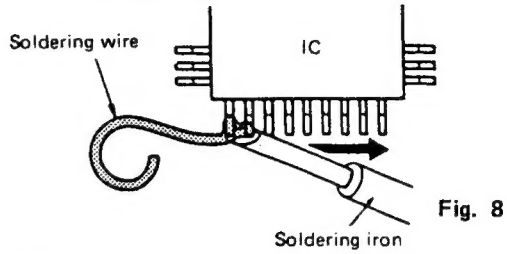


Fig. 8

CAUTION

1) If you move the iron too quickly, loose soldering is likely to result.
2) Be especially careful when soldering the first lead where loose soldering is most liable to be formed.

(8) **Check the results**

When soldering of all leads is finished, check the soldered portion on every lead with a magnifying glass. A tester must not be used or checking of any soldered position

'TION ON REPLACEMENT OF PICK-UP

er diode in the optical pick-up block is so sensitive .c electricity, surge current and etc. that the com- ; are liable to be broken down or its reliability ably deteriorated.

During repair, carefulley take the following precautions. (The following precautions are included in the service parts).

AUTIONS

ound for the work-desk.

ace a conductive sheet such as a sheet of copper ith impedance lower than $10^6\Omega$) on the work- sk and place the set on the conductive sheet so at the chassis.

ounding for the test equipment and tools.

st equipments and toolings should be grounded order that their ground level is the same the ound of the power source.

3. **Grounding for the human body.**
   Be sure to put on a wrist-strap for grounding whose other end is grounded.
   Be particularly careful when the workers wear synthetic fiber clothes, or air is dry.
4. **Select a soldering iron that permits no leakage and have the tip of the iron well-grounded.**
5. **Do not check the laser diode terminals with the probe of a circuit tester or oscilloscope.**

...TION OF EYES FROM LASER BEAM DURING SERVICING

...loys a laser. Therefore, be sure to follow ...nstructions below when servicing.

WARNING!!

...ICING, DO NOT APPROACH THE LASER ...THE EYE TOO CLOSELY. IN CASE IT IS ... TO CONFIRM LASER BEAM EMMISION, ... OBSERVE FROM A DISTANCE OF MORE ...FROM THE SURFACE OF THE OBJECTIVE ...E OPTICAL PICK-UP BLOCK.

Laser Diode Properties

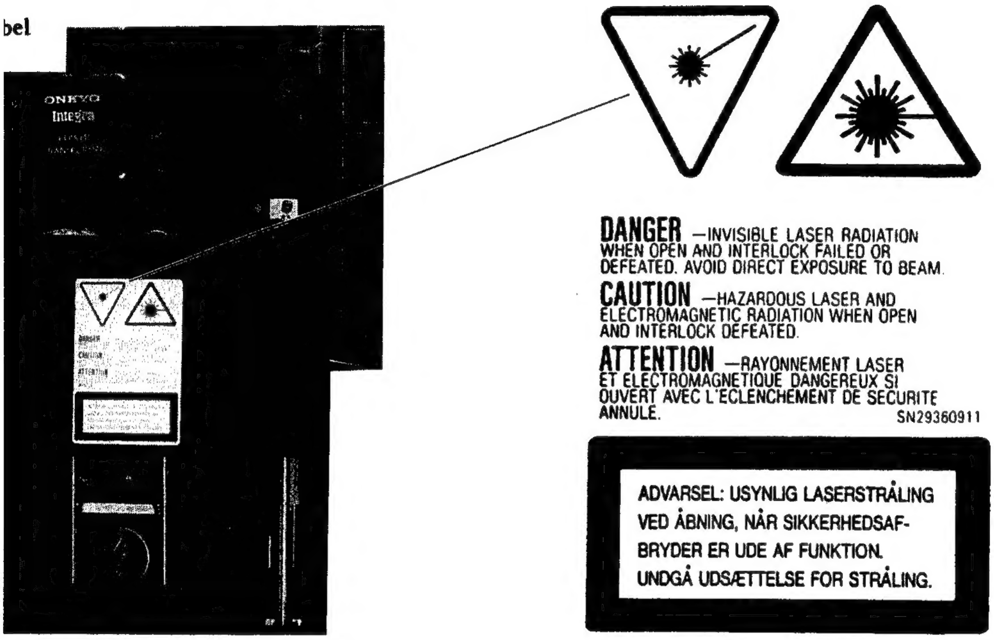
- Material: GaAS/GaAlAs
- Wavelength: 780nm
- Emission Duration: continuous
- Laser output: max. 0.5mW*

*This output is the value measured at a distance about 1.8mm from the objective lens surface on the Optical Pick-up Block.

WARNING LABEL

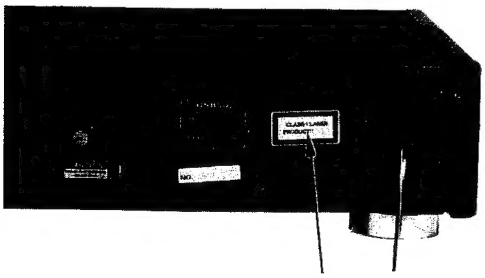
...wn below are affixed.

...bel

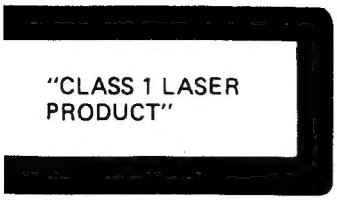


...el (Other models)

...ocated on the back panel.



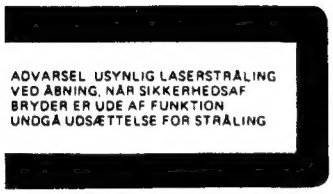
ADVARSEL



Denne mærkning er anbragt på apparatets højre side og indikerer, at apparatet arbejder med laserstråler af klasse 1, hvilket betyder, at der anvendes laserstråler af svageste klasse, og at man ikke på apparatets yderside kan blive udsat for utilladelig kraftig stråling.

APPARATET BØR KUN ÅBNES AF FAGFOLK MED SÆRLIGT KENDSKAB TIL APPARATER MED LASERSTRÅLER!

Indvendigt i apparatet er anbragt den her gengivne advarselsmærkning, som advarer imod at foretage sådanne indgreb i apparatet, at man kan komme til at udsætte sig for laserstråling.



VAROITUS! Laite sisältää laserdiodin, joka lähettää (näkymätöntä) silmille vaarallista lasersäteilyä.

ON COMPACT DISC

. Compact Discs

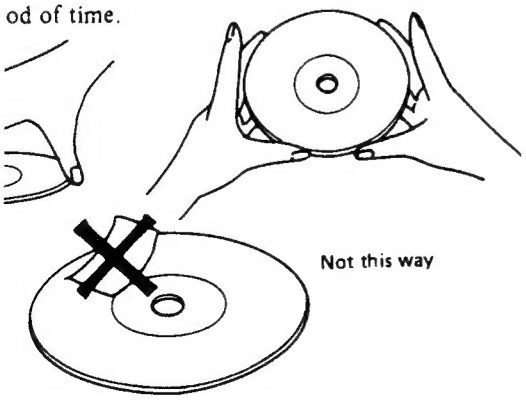
pact Discs by the edges so that you do not touch
: of disc. Remember that the side of the disc with
ow" reflection is the side containing the audio
n.

tach tape or paper to the label side of the disc
s be careful not to leave fingerprints on the side
ed.

Compact Discs

ıpact Discs in a location protected from direct
high heat and humidity and extremely high
emperatures. Discs should never be left in the
interior of an automobile in the sun since the
re can become very high in such a closed environ-

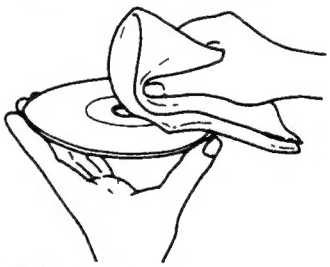
ore Compact Discs in the holders in which they
Never leave a disc in the player's disc holder for
od of time.



- **Cleaning Compact Discs**

Before playing a disc wipe off the playing surface with a soft cloth to remove dust and other soil. Wipe the surface in straight lines from the center of the disc outward, not in a circular motion as you would with a phonograph record.

Do not use benzene, chemical cleansers or phonograph record cleaning solutions to clean Compact Discs. Also avoid static electricity prevention solutions since they can damage the surface of Compact Discs.



Problems Caused by Dew

Dew can form inside a Compact player when it is brought from a cold environment into a warm room, when a room is rapidly heated and if a player is left in a humid environment.

This dew can prevent the laser pickup from reading the data contained in the pits in the disc surface. If the player does not operate properly because of dew, remove the disc and leave the player's power switch on for about one hour to remove all moisture.

·UEMBLING PROCEDURES

el removal

the four screws holding the side panels and side brackets.
the four screws holding the top panel F (A302:Front side) and side brackets.
the three screws holding the top panel B (A301:Back side) and back panel.

ircuit pc board ass'y removal (NAAF-3166-3)

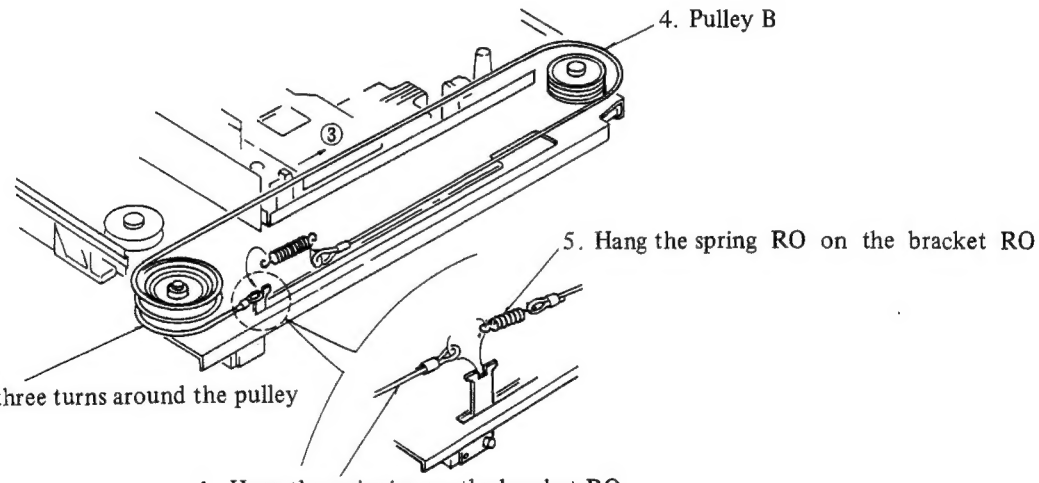
the top covers F and B.
the four screws holding holder lid (A012) and Analog pcb ass'y.
ect the five fiber cables on the Analog pcb ass'y.
the two screws holding back panel and shielded plate (A008) on the Output terminal pcb ass'y. (NAAF-3167-2)
the shielded plate (A026) on the mechanism CD. (Two screws)
ect the three sockets (JL212, JL502 and P542) on the Analog pcb ass'y.
the bracket PC (A011). (Two screws)
the bracket B (A014). (Two screws)
the analog circuit pcb ass'y.
)N:Put the analog pcb on the insulated sheet.

ircuit pc board ass'y removal

the analog circuit pcb ass'y.
the shielded plate (A015). (Two screws)
the digital circuit pc board ass'y. (Four screws)

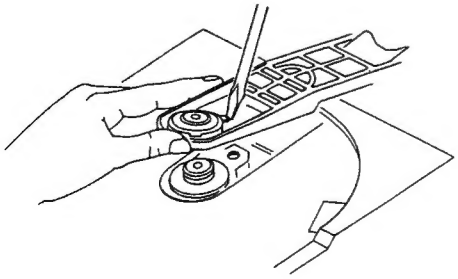
g diagram of loading section

he stringing from 1 to 5.

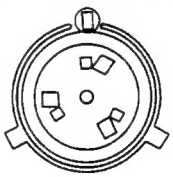


lley removal

e disc table in the closed position and no disc loaded, manually lift the chucking arm.
the disc pulley by inserting a screwdriver under the small tab.



Remove from the small tab.



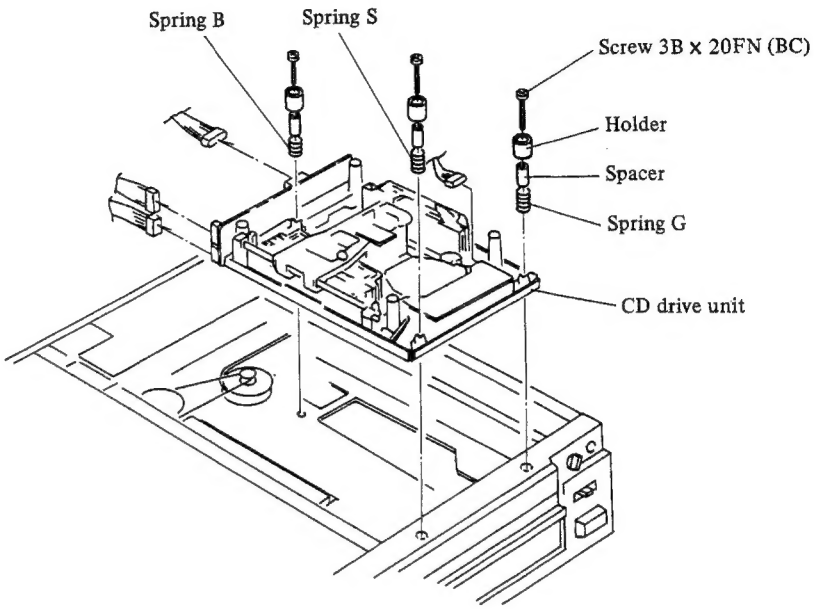
moving the loading section of the mechanism drive unit can be removed by unscrewing the ;ews which float the chassis assembly.

Take care not to expose the unit to static electricity when changing the chassis assembly. (See cautions regarding handling of the laser pickup.)

Note 2: The tensions of the three spring on which the assembly rests are different, so take care not to mix them up.

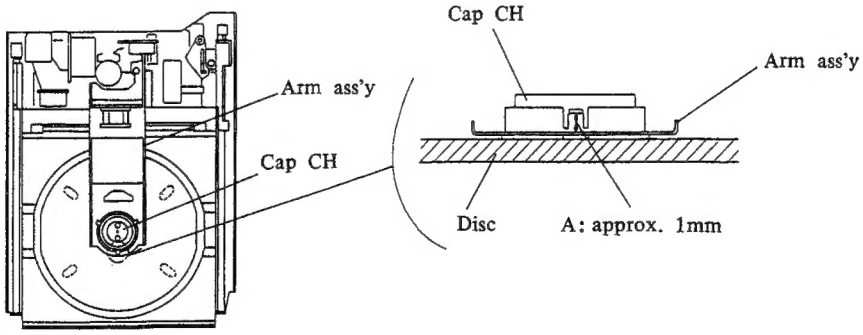
Note 3: The drive unit (BU-1) is treated as a single assembly. Consequently, parts such as the RF circuit board cannot be replaced singly.

Spring	Colour
B	Black
S	White
G	Silver



ıg arm height

lisc loaded and the disc tray closed, adjust the ıf the portion marked "A" in the figure below ı. After adjusting, perform the loading operaew times to confirm that the arm and the cap ouch.



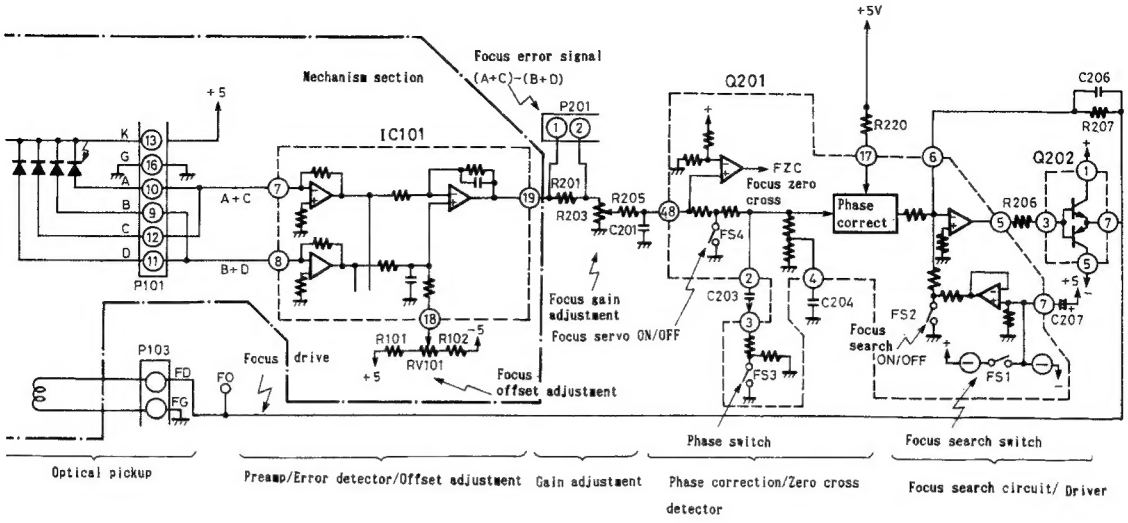


Fig. 1 Focus servo circuit

servo circuit

optical pickup objective lens, the emitted laser cused on the disc reflecting surface, an this rols the movement of the lens up and down.

letecting circuit

s detected by means of the astigmatic aberration d obtains its focus error signal from the optical ut signal (A+C)–(B+D).

ual signals (A+C) and (B+D) input to pins 7 and are subtracted by means of the IC internal op rom pin 19, the F.E. signal is output. Also, in liminate the focus error, offset adjustment is by the semi-fixed resistor RV101of pin 18 of

correction and driver circuit

f the semi-fixed resistor R203, the gain adjusted passes by way of the phase correction circuit 3 of Q201, and from pin 5 of Q201 to the driver is feedback to the coil used for driving the up objective lens. In addition, there are the FS N/OFF switch and FS3 phase characteristic tch.

zero cross circuit and focus search circuit

have mandatory drive of the objective lens in range of only 10μm at the focus point it is o turn off the above mentioned FS4 and close oop. The timing diagram for that operation is g. 2.

lar wave generated by means of the focus search nal to Q201 shifts the objective lens up/down nd at the correct focus point, the fall of F.E. tected by the focus zero cross (FZC) circuit to rvo loop. At this time, it is necessary that the FOK) signal be in the high level. In Fig. 2, the is the waveform of the focus capture failure.

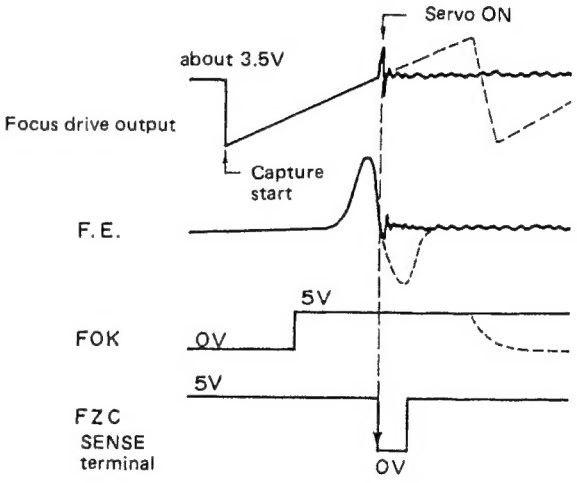
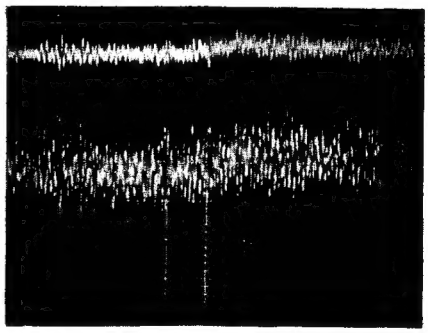


Fig. 2 Capture operation of focus



Focus signal
Upper P201
Lower FO(TP)
Vertical:0.2V/div.
Holizontal:5ms/div.

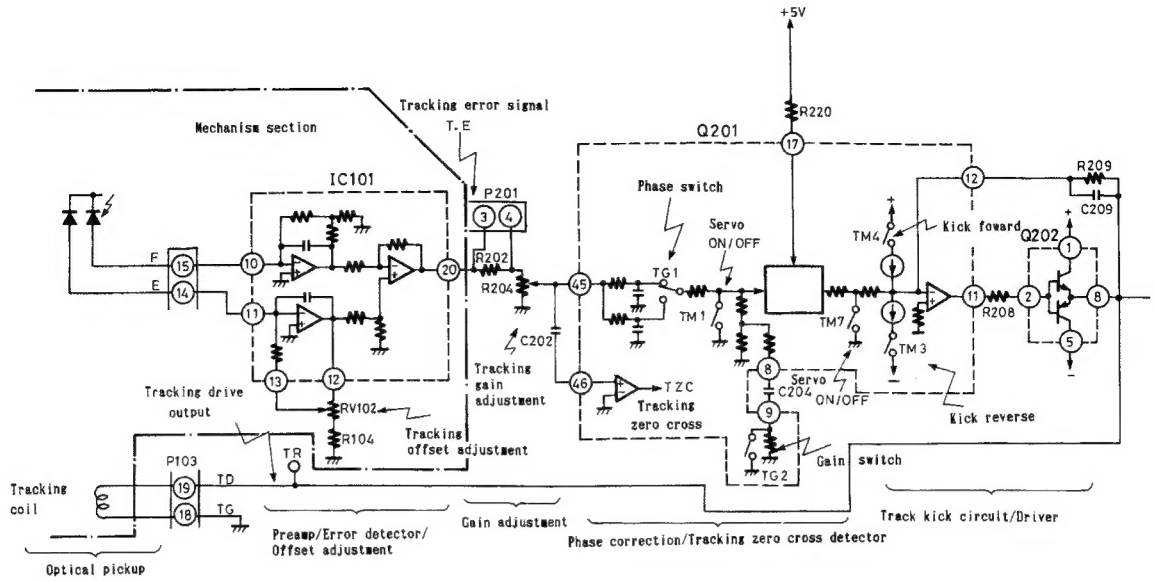


Fig. 3 Tracking servo circuit

cking servo circuit

disc at a pitch of 1.6μm, the laser beam accurately he center of the pits cut into the disc, and this is the circuit that shifts the objective lens in the radial ›n.

›or detection circuit

Ξ is obtained from the tracking error (T.E.) signal by ›f a 3 beam method. The F.E. signal input to pins 10 of IC101 is subtracted internally, and is output as ⁚. signal from pin 20. RV102 is the semi-fixed control for tracking offset.

ıse correction and driver circuit

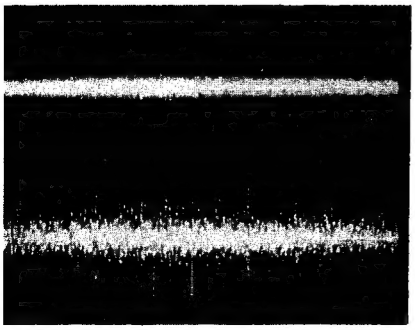
⁚. signal adjusted for gain by means of the semi-fixed R204 passes through the phase correction circuit in 45 of Q201, and from pin 11 by way of driver bjective lens. TM1 and TM7 are used as the tracking N/OFF switches, and TG1 and TG2 respectively are the phase selector and gain selector switches.

2-3. Tracking zero cross and track kick circuit

At the time the head comes out and when there is manual fast forward, in the event that is it necessary to skip over the track being traced, the T.E. signal receives a kick pulse, and by means of this, shifting of the objective lens can be achieved.

TM3 and TM4 respectively are the switches for providing the forward and reverse direction kick pulses. Also, the tracking zero cross (TZC) circuit counts the number of tracks skipped over and produces the signal in order to determine the timing of the servo ON/OFF.

The ON/OFF command for these switches is output from the microprocessor.



Tracking signal
Upper P201
Lower tr (TP)
Vertical:1V/div.
Holizontal:5ms/div.

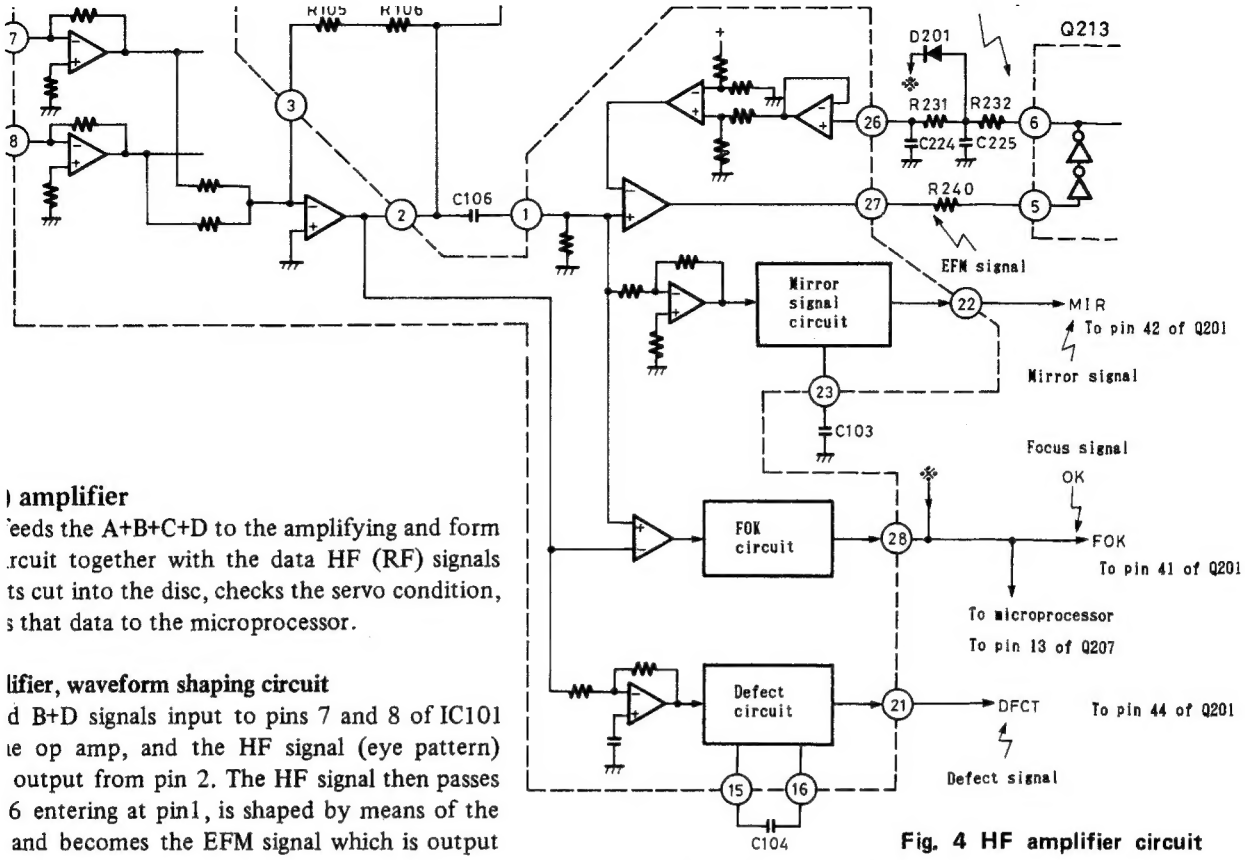


Fig. 4 HF amplifier circuit

) amplifier

'eeds the A+B+C+D to the amplifying and form .rcuit together with the data HF (RF) signals ts cut into the disc, checks the servo condition, s that data to the microprocessor.

lifier, waveform shaping circuit

d B+D signals input to pins 7 and 8 of IC101 ıe op amp, and the HF signal (eye pattern) output from pin 2. The HF signal then passes 6 entering at pin1, is shaped by means of the and becomes the EFM signal which is output

ıarator threshold value, the EFM signal low ɔnent ASY (asymmetry) is input from pin 26, s achieved by this means.

ːuit, FOK circuit, and DFCT circuit

' signal is processed the detection, shaping, etc, the MIR, FOK, and DFCT signals are output , 28, and 21.

nirror) signal

ad is extended, at the time the signal becomes lisc track and between tracks, the number of unted, and this is used for determining the e ON/OFF of the servo.

ːocus OK) signal

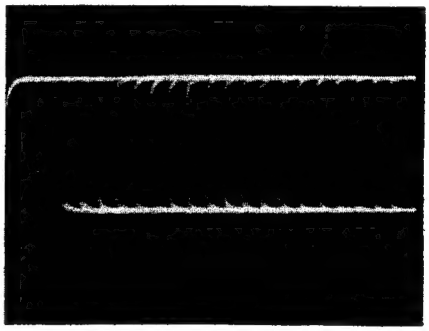
ɔes high at the time the focus servo is required. 3)

(defect) signal

lefect (scratch, dirt, etc.) in the disc, this signal e servo and gain are controlled, and the circuit und outburst.

/o circuit

ıct disc there is a CLV system (constant linear l at the replay position, because the disc rotary the clock is taken out of the HF signal, and cuit and its clock must be synchronized to ɔindle motor.



EFM output signal
Vertical:1V/div.
Holizontal:5ms/div.
Insert the resistor 2.2kohm between probe of oscilloscope and test point.

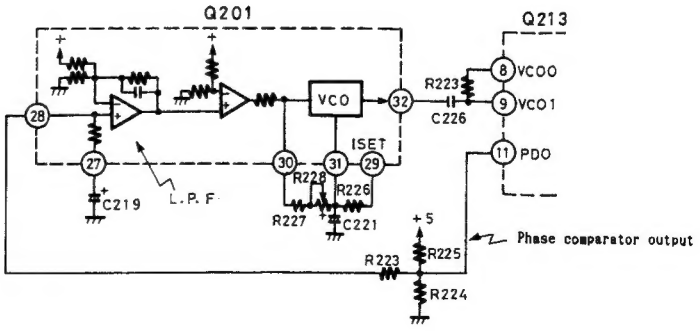


Fig. 5 PLL circuit

n in Fig. 5, for the phase comparator, in Q213 the
l VCO are each built into Q201. The semi-fixed
R228 is the control for adjusting the 4.3225 MHz
frequency (WFCK = 7.35 KHz).

The output of the phase comparator (MDS) and frequency comparator (MDS) from pins 3 and 4 of Q213 is fed to pins 34 and 36 of Q201. Also, the spindle motor ON/OFF signal (MON) from pin 2 of Q213, and the phase selector signal (FSW) from pin 1, are output and fed to pin 36 of Q201. After these signals are processed in Q201, they are passed from pin 39 through the driver IC151, and are supplied to the spindle motor.

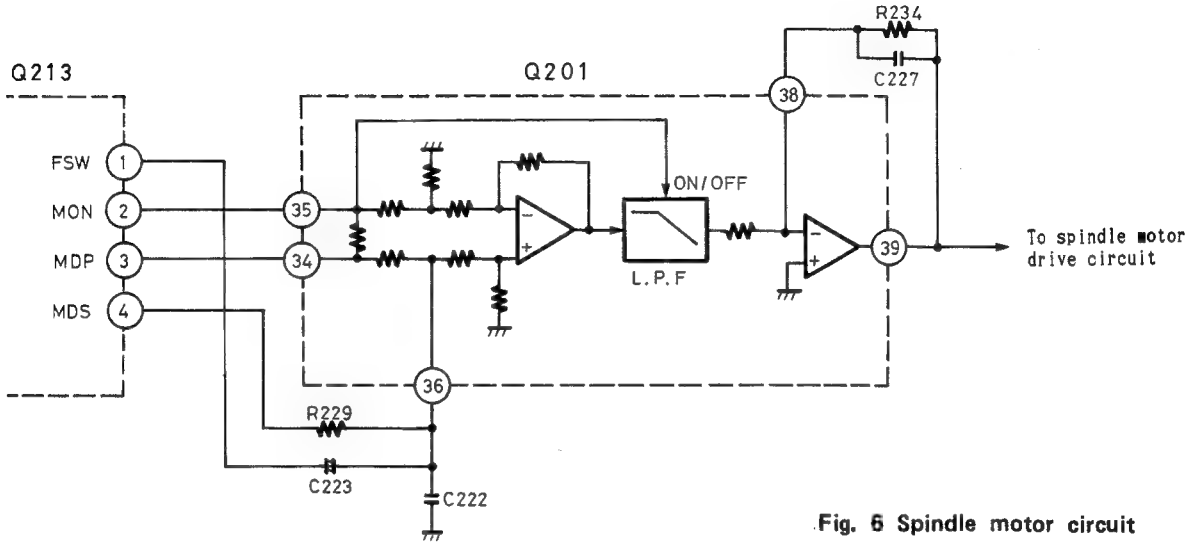


Fig. 6 Spindle motor circuit

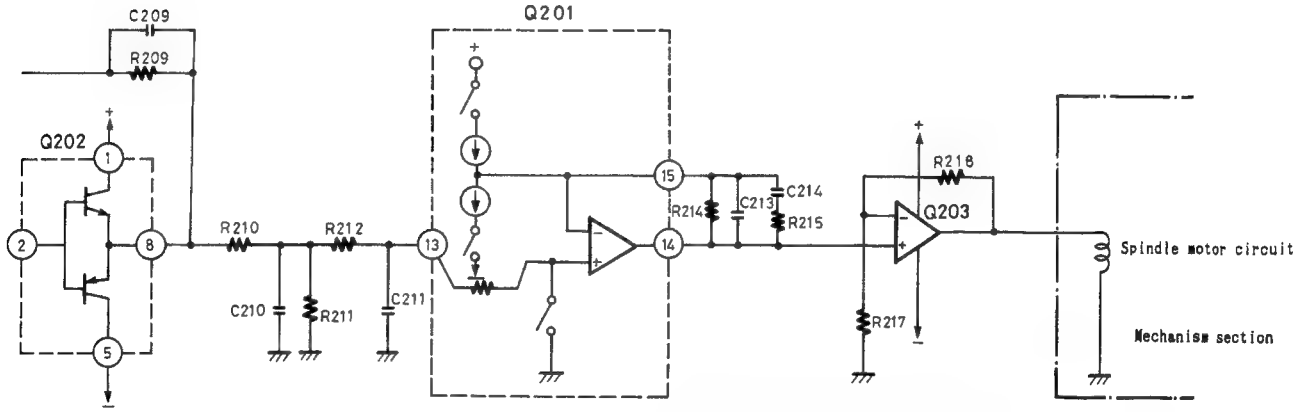
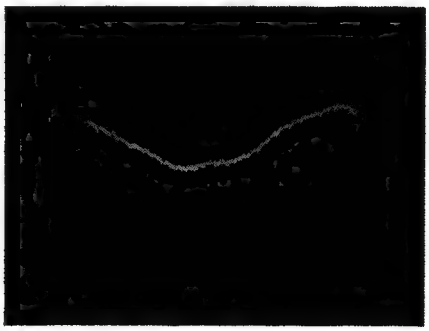


Fig. 7 slide motor circuit

motor circuit

cuit controls the slide motor which is used for the optical pickup from inside the disc to the In the normal playback time, the low region ent of the tracking driver output is amplified and ne motor, but when the head is extended, switches l TM6 internal to Q201 control the ON/OFF.



SLD signal(T.P)
Vertical:1V/div.
Holizontal:20ms/div.

ıl signal processor output signal (Q213) and ·ol signals are input into a digital filter Iere they undergo 8-times oversampling and ıt at an 8-times higher rate. These signals ıgh the interface circuitry (Q303 – Q305) ɔy are converted into signals to drive the C unit.

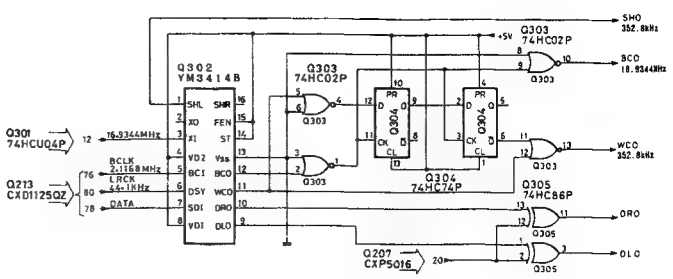


Fig. 8 Digital filter and interface circuit

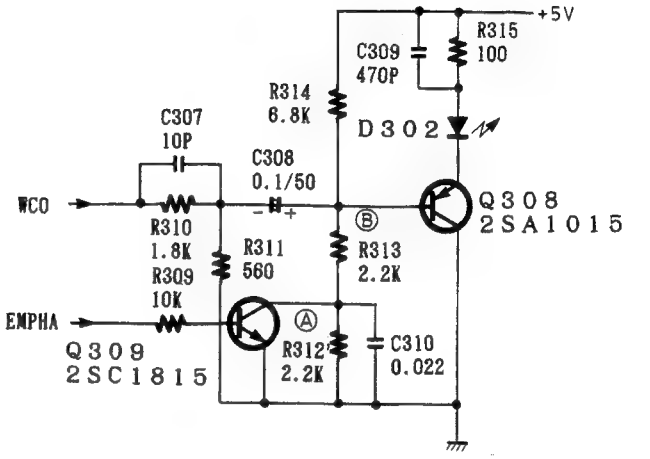


Fig. 9 Opto. transfer circuit drive circuit

ıta transfer transmitter drive

itry illustrated in Fig. 9 superimposes the al on the emphasis signal and drives the op- itry. WCO is a repeating 352.8kHz signal. is a "high" or "low" DC signal. When s high (emphasis on), Q309 is conductive ɔias of Q308 is determined by division of ! R313. On the other hand, if EMPHA is hasis off), Q309 is non-conductive, so the)308 is determined by division of R313, R314. The WCO signal is blocked by C310 in order to prevent it from changing the voltage changes which occur during empha- on are illustrated in Table 1.

Operation \ Voltage (V)	A	B	C
Emphasis ON	0	1.3	3.7
Emphasis OFF	1.0	2	4.3

Table 1

ta transfer receiver preamplifier

mposed WCO and EMPHA signals are trans- ı an optical fiber cable and received by ɜre they are converted into an electrical ɜ WCO signal is input into Q402 pin 1. R414 resistance. After being amplified by Q402, ıt from pin 5. Next, after passing through shaping circuit Q407, it is used as the D/A word clock signal.

um operation point varies due to inconsis- the sensitivity of the optical transmitter ɜr outputs (D302 and D402).

semi-fixed resistor R411 is provided for :.

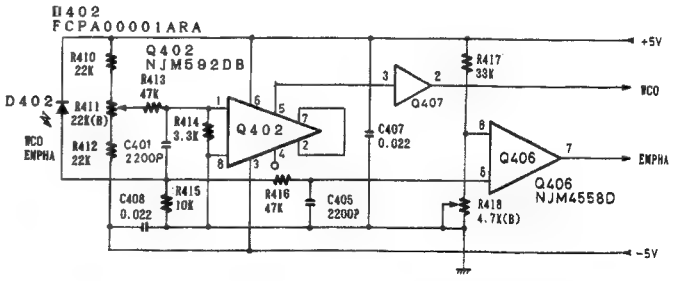


Fig. 10 Optical data transfer receiver preamplifier circuitry

ɔnsisting of C405 and R416. Only the DC signal
:s are input into Q406 pin 5. R415 is the load re-
:. The emphasis on and off center voltages are set
ni-fixed resistor R418.

ıl-parallel interface

data signal, after demodulation in the optical re-
:r preamplifier, is converted into a parallel signal
.e interface circuitry illustrated in Fig. 11.
converted signal is then input into the parallel-
t 18-bit D/A converter.
18 data bits (DAL) are assigned to the registers
)9, Q411 and Q413) using the 18-bit bit clock
ıl. The 19th bit of the bit clock signal activates
word clock (WCO) and the values of each of the
ters are output. This output is held until the next
its of data are collected.

erence)

sine wave is input (track 2 on test disc YEDS 18),
B1 (MSB) waveform will be a short wave with a
ratio of 50%.

erence) 8-times oversampling

n 8-times oversampling digital filter, the data is
)led at 8-times the usual sampling frequency. At
ıormal 44.1kHz sampling rate, noise elements are
rated at a frequency 20kHz below the sampling
ıency, or 24.1kHz. In order to prevent this noise
ı passing through the analog filter, a very steep
dB/oct.) filter must be used. A steep filter of
sort has a deleterious effect on the playback
d. The 8 times oversampling digital filter raises
sampling frequency to 352.8kHz. This, in turn,
s the frequency at which noise begins to 332.8
so an analog filter with a more gentle attenua-
slope (18dB/oct.) can be used. The adverse ef-
on the playback sound typical of steep filters
eliminated. Waveforms following D/A conversion
ıe conventional sampling frequency and with 8-
s oversampling are given in Figs. 12 and 13.

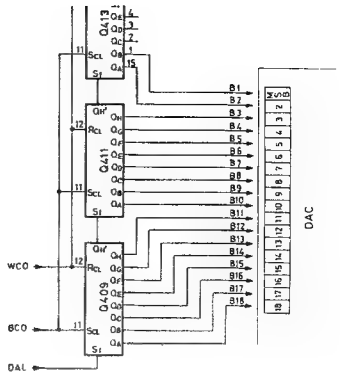


Fig. 11

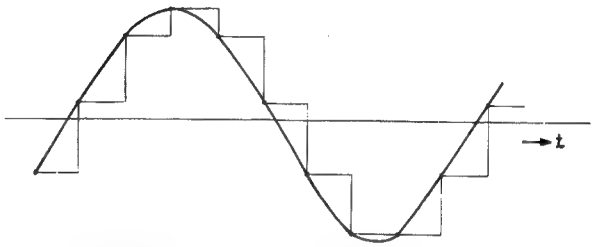


Fig. 12 Waveform following D/A conversion at conventional sampling frequency(Fs= 44.1kHz)

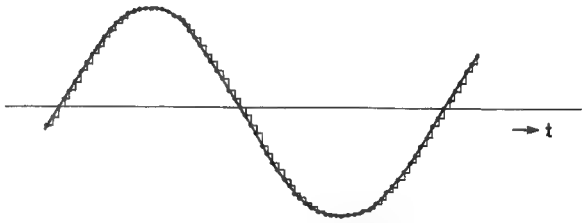


Fig. 13 Waveform following D/A conversion with 8-times oversampling (Fs = 352.8kHz)

Fig. 14 and 15 show the difference between the waveforms in Figs. 12 and 13 above on the frequency spectrum.

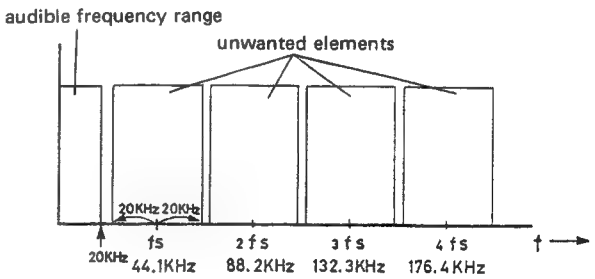


Fig. 14 Fs = 44.1kHz

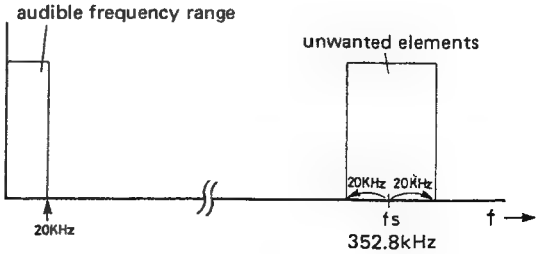
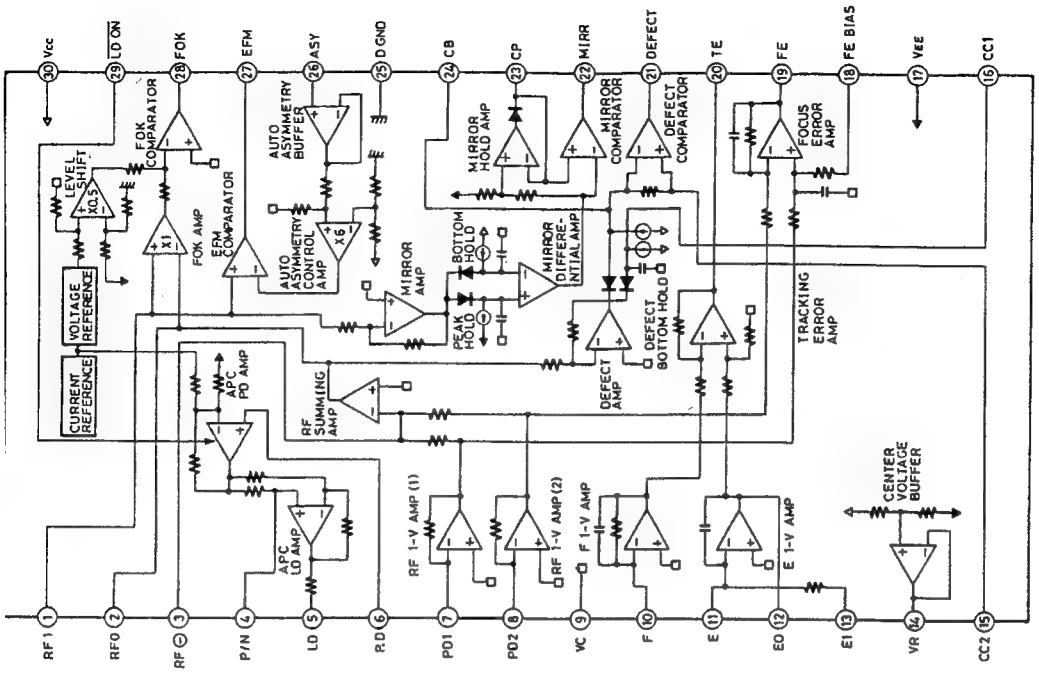


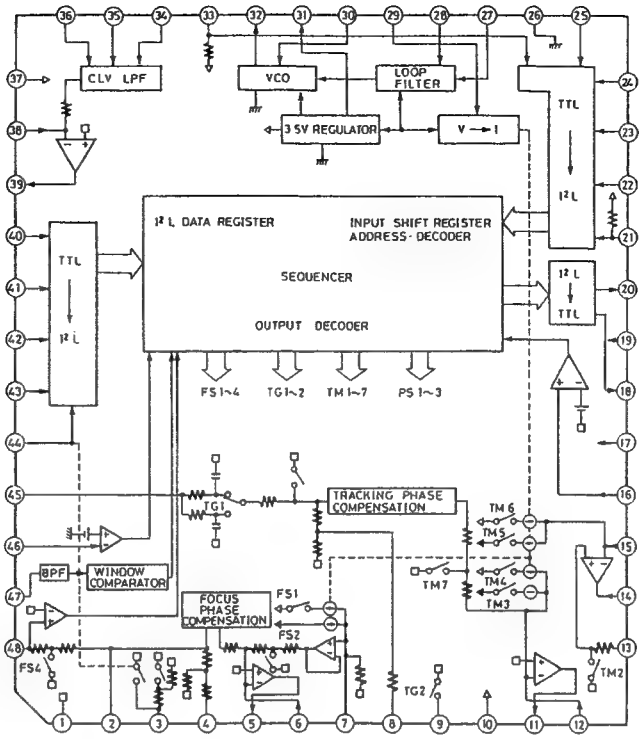
Fig. 15 Fs = 352.8kHz

/CK DIAGRAM AND DESCRIPTIONS

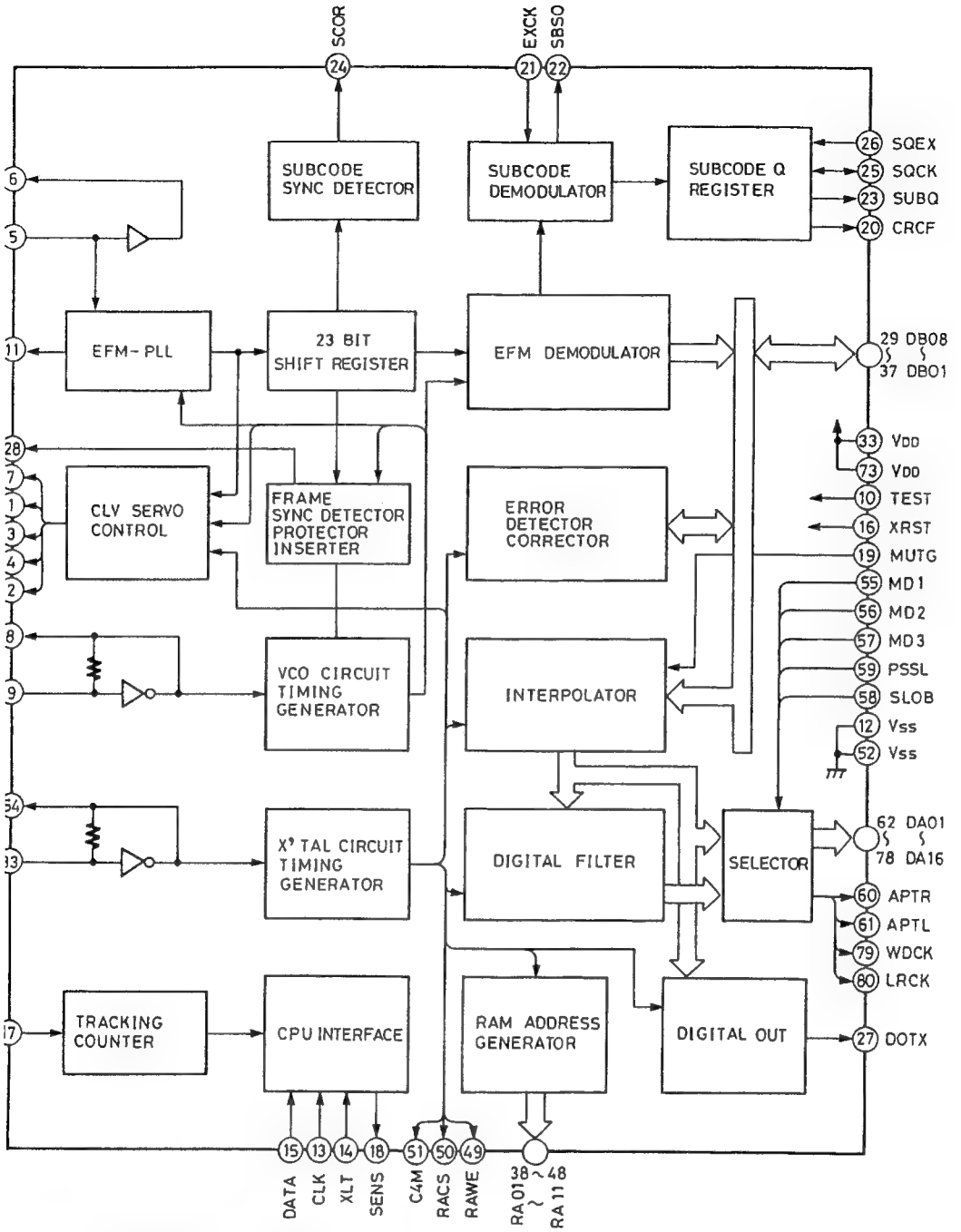
A1081M (RF Amp)



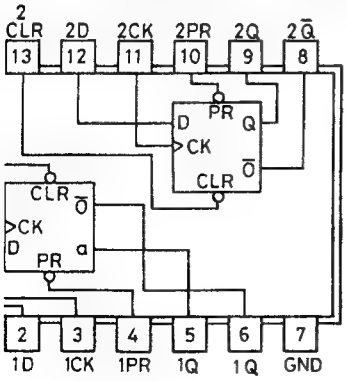
Symbol	Function	Pin No.	Symbol	Function
RFI	Input terminal of output signal of RF summing amplifier via the coupling capacitor	16	CC1	Defect bottom hold output terminal
RFO	Output terminal of RF summing amplifier	17	V_{EE}	Negative power supply terminal
RF⊖	Input terminal of RF summing amplifier feedback	18	FE BIAS	Non-inversion bias terminal of focus error amplifier CMR adjustment of focus error amplifier
PIN	Switching terminal of P-SUB/N-SUB of LD (laser diode)	19	FE	Output terminal of focus error amplifier
LD	Output terminal of APC LD amplifier	20	TE	Output terminal of tracking error amplifier
PDD	Input terminal of APC PD (Pin diode) amplifier	21	DEFECT	Output terminal of defect comparator
PD1	Inversion input terminal of RF I-V amplifier (1) Connect to A+C of PIN diodes.	22	MIRR	Output terminal of mirror comparator
PD2	Inversion input terminal of RF I-V amplifier (2) Connect to B+D of PIN diodes.	23	CP	Connection terminal of capacitor for mirror hold Non-inversion input of mirror comparator
VC	Connect to GND.	24	CB	Connection terminal of capacitor for defect bottom hold
F	Inversion input terminal of F I-V amplifier Connect to F of PIN diode.	25	DGND	Connect to GND
E	Inversion input terminal of E I-V amplifier Connect to E of PIN diode.	26	ASY	Auto asymmetry control input terminal
EO	Output terminal of E I-V amplifier	27	EFM	Output terminal of EFM comparator
EI	Feedback input terminal of E I-V amplifier Gain adjustment of E I-V amplifier	28	FOK	Output terminal of FOK comparator
VR	DC voltage output terminal of (V_{CC} + V_{EE})/2	29	$\overline{\text{LD ON}}$	ON/OFF switching terminal of laser diode
CC2	Input terminal from defect bottom hold output signal via the coupling capacitor	30	Vcc	Positive power supply



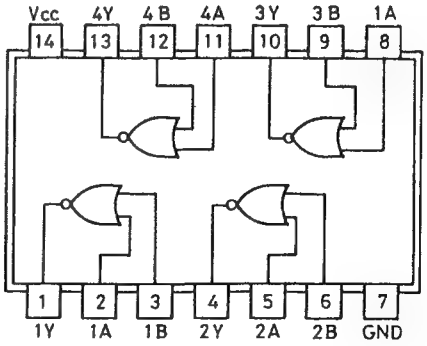
Symbol	Function	Pin No.	Symbol	Function
FGD	Insert the capacitor between this terminal and pin 3 when drop the high frequency gain of focus servo	28	PDI	Input terminal of phase comparator output PDO
FS3	Switching terminal of high frequency gain of focus servo	21 22 23 24 25 33	DIRCT XRST DATA XTL CLK LOCK	Input terminals for microcomputer and interface
FLB	Time constant switching terminal when raise the low frequency gain of focus servo	29	ISET	Flow the current to decide the focus search, track jump, and kick height
FEO TAO SLO SPDLO	Operation amplifier output terminals for power transistor drive	30	VCOP	VCO free run frequency is proportion to resistor value between pins 30 and 31
FE−	Inversion input terminal of focus amplifier	32	C864	VCO (8.64MHz) output terminal
SRCH	Time constant terminal to make the focus search waveform	34	MDP	Connection terminal to terminal MDP of CXD1125QZ
TGU	Time constant terminal for high frequency gain switching of tracking	35	MON	Connection terminal to terminal MON of CXD1125QZ
TG2	Time constant terminal for high frequency gain switching of tracking	36	FSW	LPF time constant terminal of CLV servo error signal
TA−	Inversion input terminal of tracking amplifier	38	SPDL−	Inversion input terminal of spindle drive amplifier
SL+	Non-inversion input terminal of sled amplifier	40 41 42 44	WDCK FOK MIRR DFCT	Input terminals for microcomputer and interface
SL−	Inversion input terminal of sled amplifier			
SSTOP	Limit switch ON/OFF detector signal terminal for disc innermost position detector	45	TE	Tracking error signal input terminal
FSET	Terminal of peak of phase compensation of focus tracking and of setting of LPF	46	TZC	Tracking zero cross comparator input terminal
SENS C.OUT	Output terminals for microcomputer and interface	47	ATSC	Window comparator input terminal for ATSC detection
BW	Time constant terminal of loop filter	48	FE	Focus error signal input terminal



74P (D Flip-flop with preset)

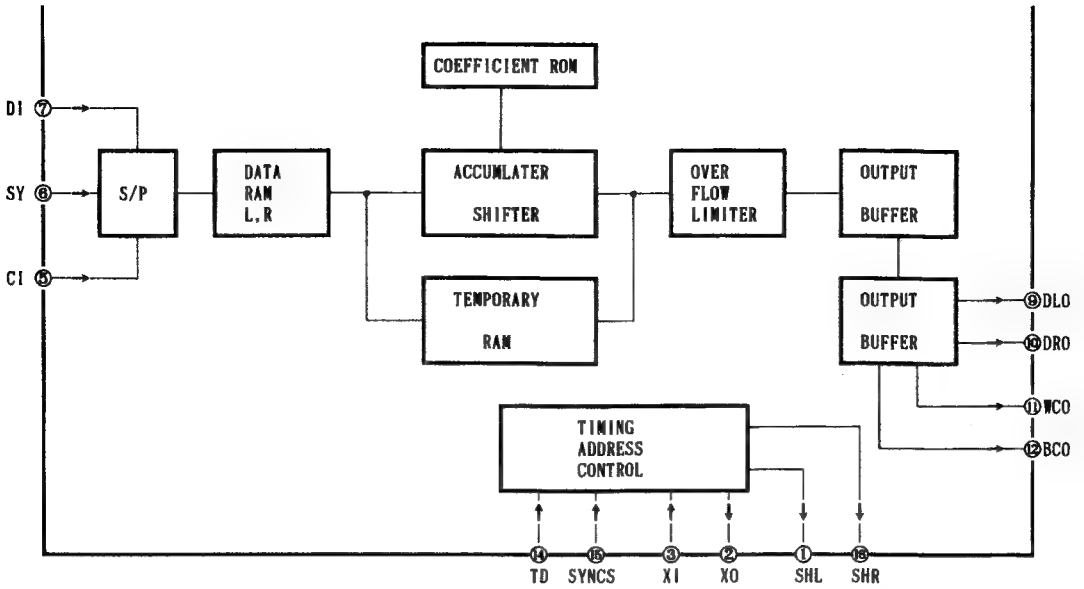


74HC02 (NOR gates)



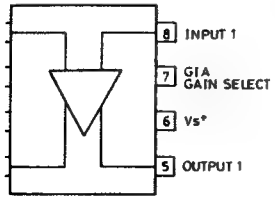
Symbol	Function
FSW	Time constant switching output terminal of output filter of spindle motor
MON	ON/OFF control output terminal of spindle motor
MDP	Drive output terminal of spindle motor. Rough control when mode CLV-S and phase control when mode CLV-P
MDS	Drive output terminal of spindle motor. Speed control when mode CLV-P
EFM	EFM signal input terminal from RF amplifier
ASY	Output terminal to control the slice level of EFM signal
LOCK	GFS sampling terminal
VCOO	VCO output terminal. 8.6436MHz when lock to EFM signal
VCOI	VCO input terminal
TEST	0V
PDO	Phase comparator output terminal of EFM signal and VCO/2
Vss	Ground
CLK	Serial data transmitter clock input terminal from microcomputer
XLT	Latch input terminal from microcomputer
DATA	Serial data input terminal from microcomputer
XRST	System rest input terminal. Reset at low level.
CNIN	Tracking pulse input terminal
SENS	Inner condition output terminal correspond to address
MUTG	Muting input terminal
CRCF	CRC check output terminal of subcode Q
EXCK	Clock input terminal for serial output of subcode
SBSO	Serial output terminal of subcode
SUBQ	Subcode Q output terminal
SCOR	Subcode sink S0 + S1 output terminal
SQCK	Clock terminal to read the subcode Q
SQEX	Selector input terminal of SQCK
DOTX	Digital output terminal
GFS	Indicator output of lock condition of frame sync
DB08 ~ DB05	Data terminals of external RAM
V_{DD}	+5V
DB04 ~ DB01	Data terminals of external RAM
RA01 ~ RA11	Address output terminals of external RAM

Pin No.	Symbol	Function
49	RAWE	Write enable signal output to external RAM
50	RACS	Chip selector signal output to external RAM
51	C4M	Divider output of crystal. f=4.2336MHz
52	Vss	Ground
53	XTAI	Input terminal of crystal oscillator
54	XTAO	Output terminal of crystal oscillator
55 ~ 57	MD1 ~ MD3	Mode switching input terminals
58	SLOB	Code switching input of audio data output.
59	PSSL	Mode switching input of audio data output. Serial output at low level. Parallel output at high level
60	APTR	Control output for aperture correction. High level when Rch.
61	APTL	Control output for aperture correction. High level when Lch.
62	DA01	DA01 (LSB of parallel sound output) output when PSSL = H. C1F1 output when PSSL = L
63	DA02	DA02 output when PSSL = H. C1F2 output when PSSL = L.
64	DA03	DA03 output when PSSL = H. C2F1 output when PSSL = L.
65	DA04	DA04 output when PSSL = H. C2F2 output when PSSL = L.
66	DA05	DA05 output when PSSL = H. C2FL output when PSSL = L.
67	DA06	DA06 output when PSSL = H. C2PO output when PSSL = L.
68	DA07	DA07 output when PSSL = H. RFCK output when PSSL = L.
69	DA08	DA08 output when PSSL = H. WFCK output when PSSL = L.
70	DA09	DA09 output when PSSL = H. PLCK output when PSSL = L.
71	DA10	DA10 output when PSSL = H. UGFS output when PSSL = L.
72	DA11	DA11 output when PSSL = H. GTOP output when PSSL = L.
73	V_{DD}	Power supply (5V)
74	DA12	DA12 output when PSSL = H. RAOV output when PSSL = L.
75	DA13	DA13 output when PSSL = H. C4LR output when PSSL = L.
76	DA14	DA14 output when PSSL = H. C210 output when PSSL = L.
77	DA15	DA15 output when PSSL = H. C210 output when PSSL = L.
78	DA16	DA16 (MSB of parallel sound output) output when PSSL = H. DATA output when PSSL=L
79	WDCK	Strobe signal output. 176.4kHz when DF is on. 88.2kHz when DF is off.
80	LRCK	Strobe signal output. 88.2kHz when DF is on. 44.1kHz when DF is off.

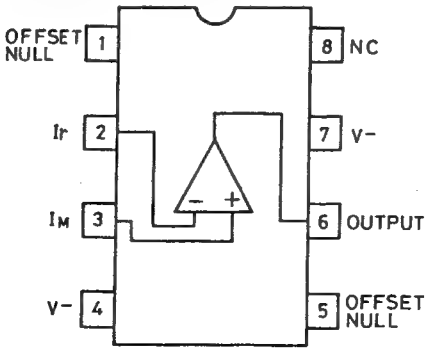


PIN NO.	TERMINAL	I/O	DESCRIPTION
1	SHL	O	When one DAC(TD=L):Deglitching signal of left channel (when four times) When two DAC(TD=H):Deglitching signal of left and right channels(when eight times)
2 3	XO XI	O I	Connect the x'tal oscillator between XI and XO. The clock frequency is 384×Fs.
4	VDD2		+5V:Power supply terminal for x'tal oscillator and deglitching signal.
5 6 7	BCI SDSY SDI	I I I	Bit clock input terminal. Clock shown L/Rch division of input data and input timing. 16 bits serial data input terminal.
8	VDDI		+5V:Power supply terminal for digital signal.
9	DLO	O	When one DAC(TD=L):Output terminal for L/R channel data (When four times) When two DAC(TD=H):Output terminal for L channel data (when eight times)
10 11 12	DRO WCO BCO	O O O	R channel data output terminal. Word clock of output data DLO/DRO. Bit clock of output data.
13	VSS		Ground terminal
14	TD	I	1DAC/2DAC selector terminal: 1DAC at low. 2DAC at high.
15	SYNCS	I	Asynchronous input jitter absorption synchronous signal. Synchronous input at high level. SDSY inhibiting at low level.
16	SHR	O	R channel deglitching signal when one DAC.

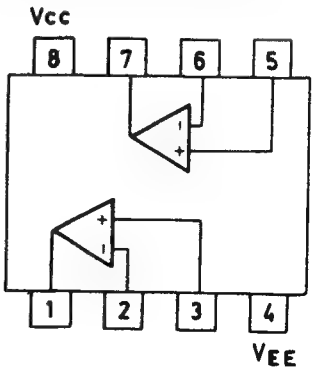
3 (Operation amp)



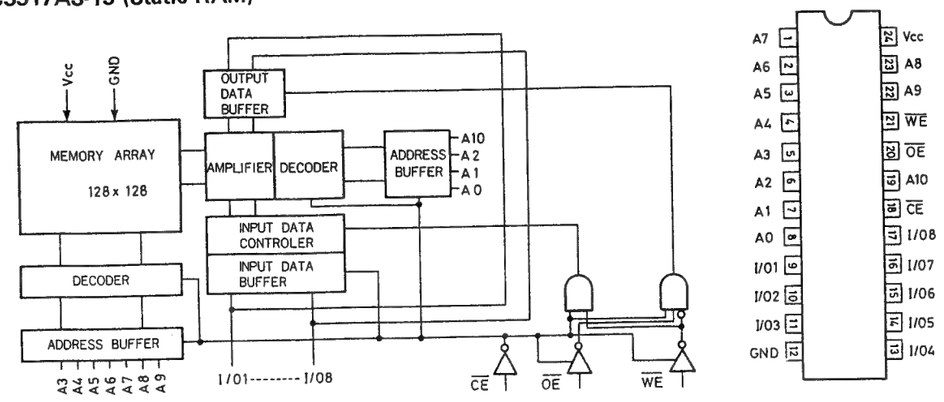
μPC813C (Operation amp)



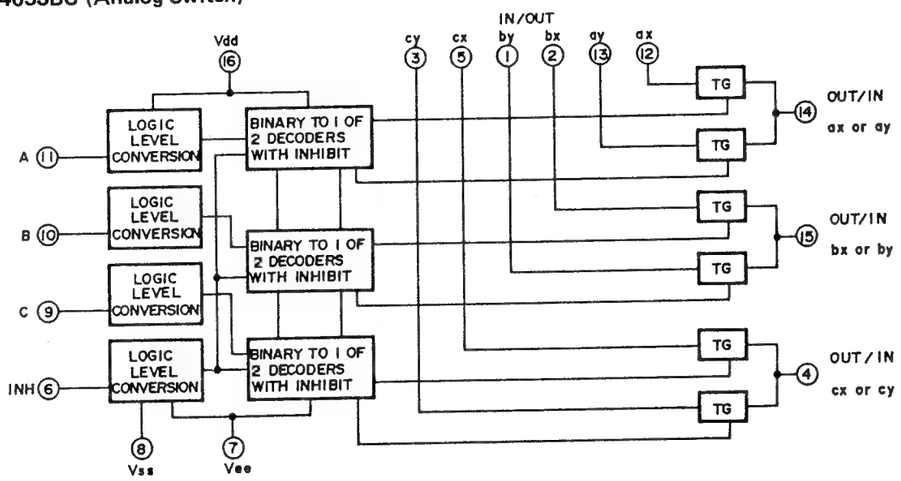
NJM5532DD (Operation amp)



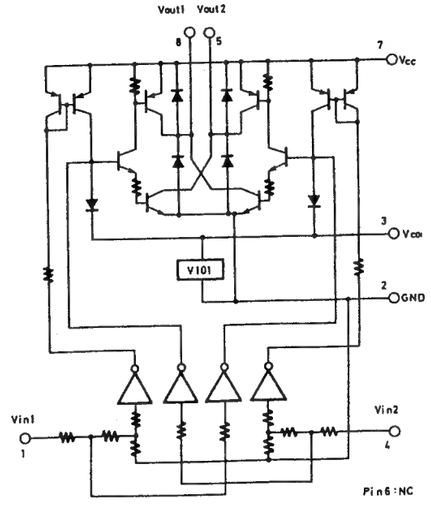
LC3517AS-15 (Static RAM)



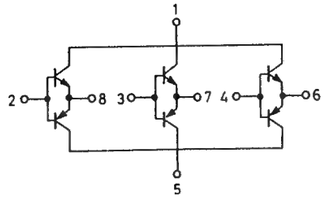
μPD4053BC (Analog Switch)



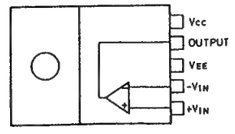
LB1630 (Motor Drive)



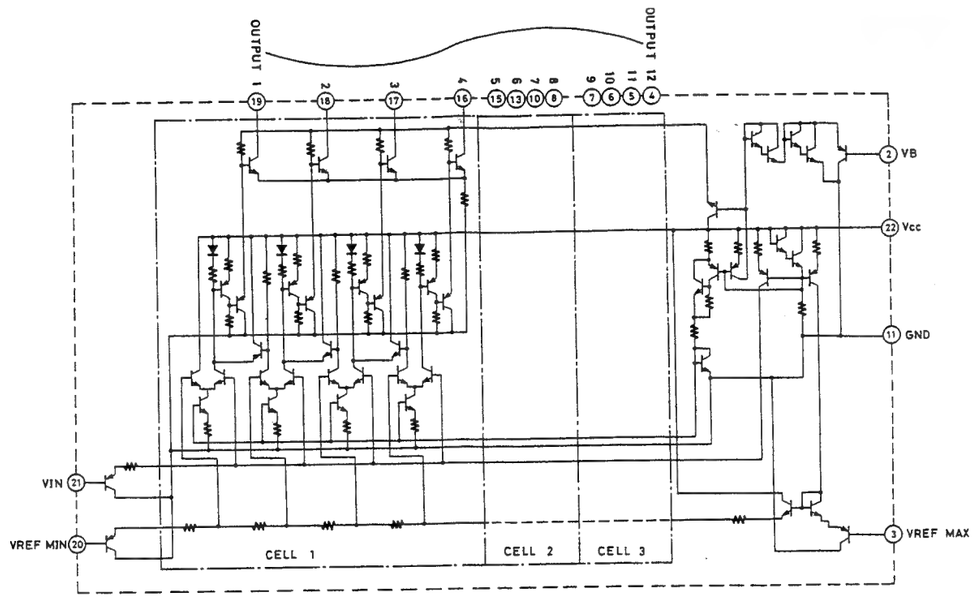
STA341M (Transmitter Array)



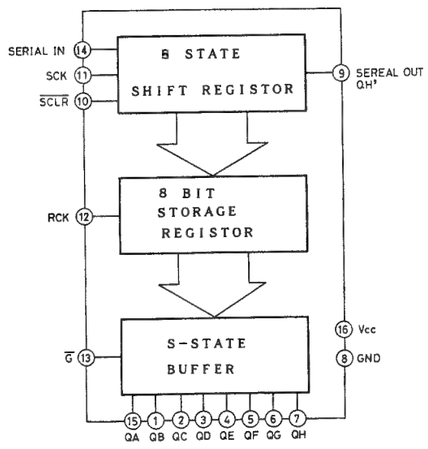
LA6500 (Power OP Amp)



IR2406 (LED driver)



74HC595P (8 bits shift resistor)

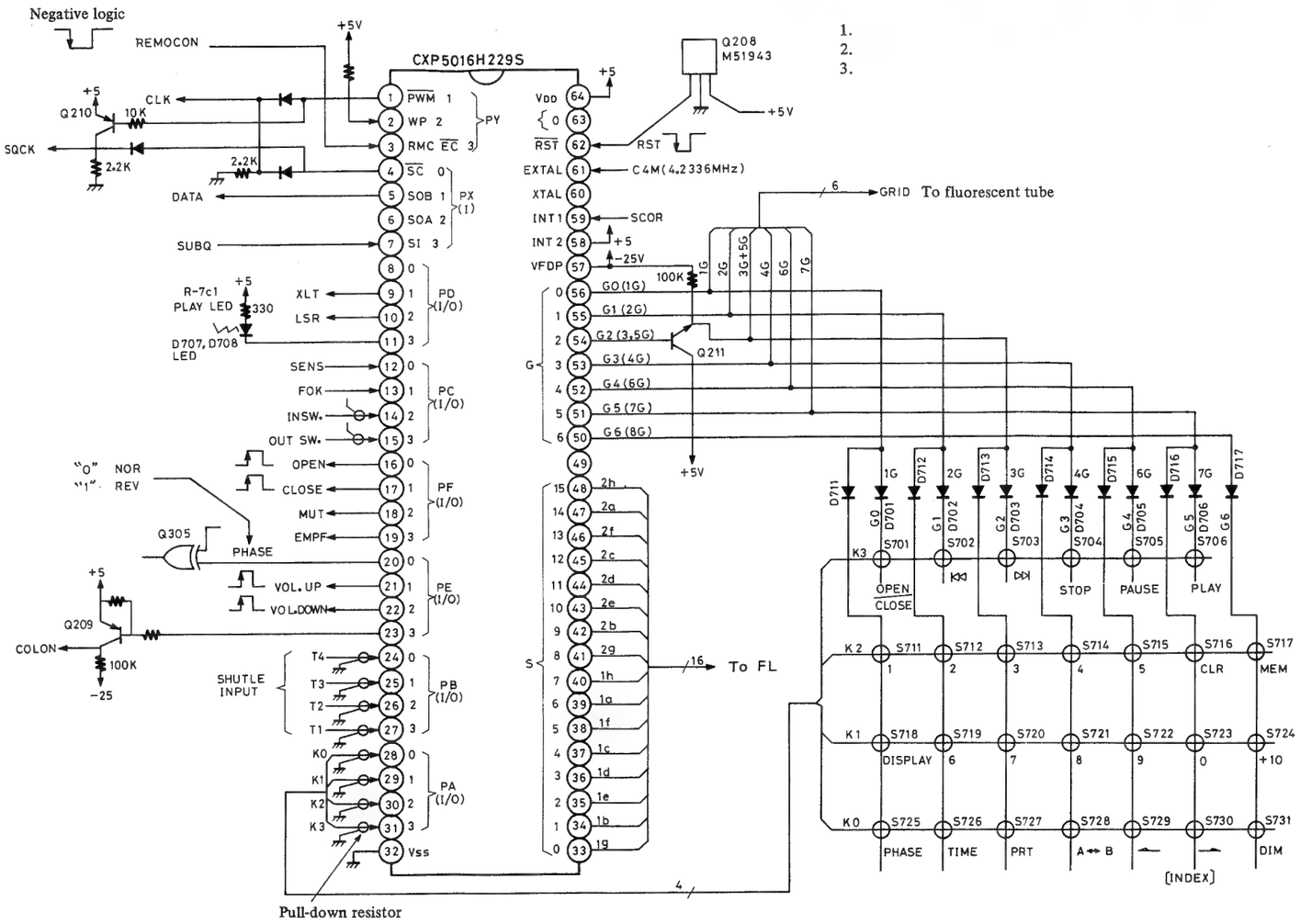


INPUTS					Resulting function
SI	SCK	SCLR	RCK	G	
X	X	X	X	H	Output QA-QH are in the high impedance state.
X	X	X	X	L	Latch Outputs, QA-QH, are enabled.
X	X	L	X	X	Shift registor contents are cleared.
L	↑	H	X	X	A low logic level is shifted into the shift registor.
H	↓	H	X	X	A high logic level is shifted into the shift registor.
X	↓	H	X	X	Shift registor remains unchanged.
X	X	X	↑	X	Shift registor data stored in the 8-bit storage resistor.
X	X	X	↓	X	Storage registor remains unchanged.

X:Don't Care

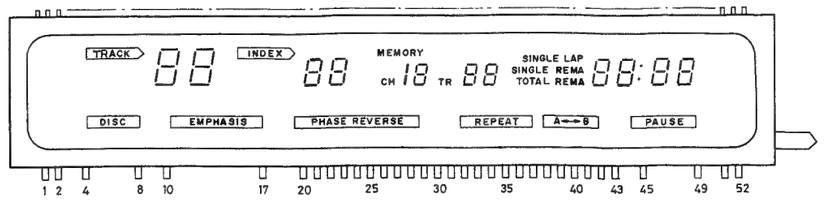
1. Output disable (QA-QH)
2. Output enable (QA-QH)
3. Clear the shift registor

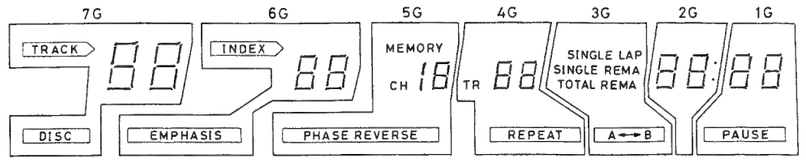
CXP5016H-229S (Microprocessor)

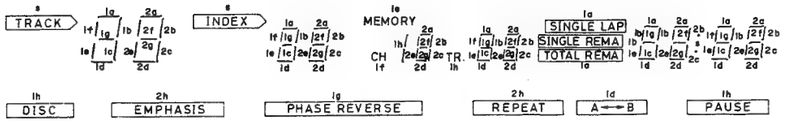


1.
2.
3.

FIP13JM (Fluorescent tudbe)



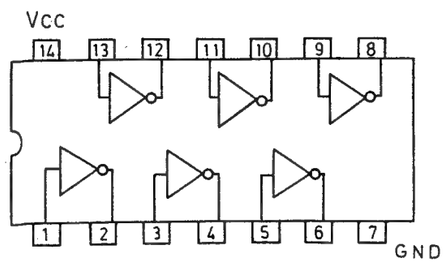




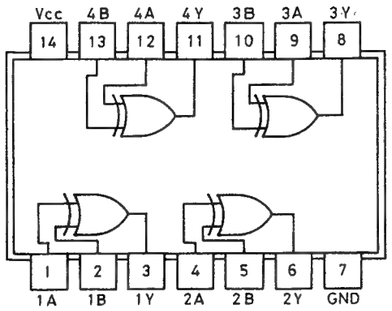
TERMINAL NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ELECTRODE	F	F	NP	7G	NP	NP	NP	7G	NP	6G	NP	NP	NP	NP	NP	NP	6G	NP
TERMINAL NO.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
ELECTRODE	NP	5G	1g	1b	1e	1d	1c	1f	1a	5G	1h	2h	S	4G	2a	2f	2c	2d
TERMINAL NO.	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
ELECTRODE	4G	3G	2e	2b	2g	3G	2G	NP	1G	NP	NP	NP	1G	NP	F	F		

NOtes F: Filament NP: No pin
G: Grid

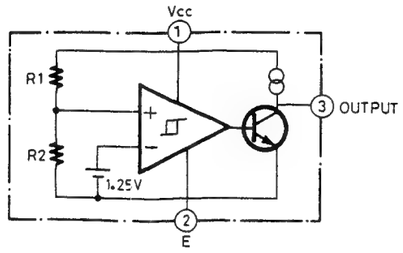
74HC04P (Hex inverter)



74HC86P (Exculsive 0R)



M51943ASL (System reset)



ADJUSTMENT PROCEDURES

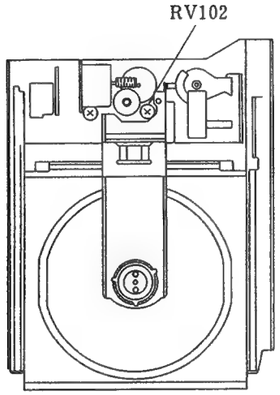
Instruments required: Dual trace oscilloscope(Use the high impedance probe:10:1),Frequency counter,AF oscillator,AC voltmeter,Distortion analyzer,Insulated adjustment bar
Test disc(SONY :YEDS18), 4P socket P201(Part No. 25050138)

Servo circuit adjustment
Preparation:Disconnect the five opto. fiber cabels and Analog circuit pc board ass'y.(Refer page 6)

1.VCO frequency adjustment
Connect the frequency counter to test point PLCK.
Turn the power switch to ON(No load the disc).
Adjust R228 until the frequency counter reading becomes 4.32±0.01MHz.
After adjustment,disconnect the frequency counter.

2.Tracking offset adjustment
Playback the track 2 of test disc.
Turn R204 to the minimum position(counterclockwise).
Connect the oscilloscope to pin 4 of plug P201.
Adjust RV102 until the center of tracking error signal on the oscilloscope becomes GND(Ground) level.
Turn R204 to the mechanical center.
After adjustment,disconnect the oscilloscope.

Photo 1
Range:Vertical:0.5V/div.
Holizontal:0.5mS/div.



Note:The pickup moves to the outer edge of the disc and stops at 15second intervals.When this happens,press the PLAY button again.

3.Focus gain adjustment
Set the output of AF oscillator to 800Hz,1~1.5Vp-p.
Playback the track 2 of test disc.
Connect the oscilloscope and the AF oscillator as shown below.
Adjust R203 until the 800Hz components of channel 1 and 2 become the same level.
After adjustment,disconnect the oscilloscope and AF oscillator.

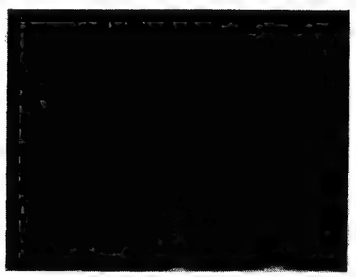
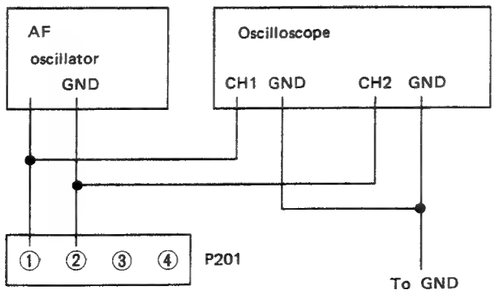


Photo 2
Range:Vertical:0.2V/div.
Holizontal:0.5mS/div.



4.Tracking gain adjustment
Set the output of AF oscillator to 1.2kHz, 1~1.5Vp-p.
Playback the track 2 of test disc.
Connect the oscilloscope and the AF oscillator as shown below.
Adjust R204 until the 1.2kHz components of channel 1 and 2 become the same level.
After adjustment,disconnect the oscilloscope and AF oscillator.

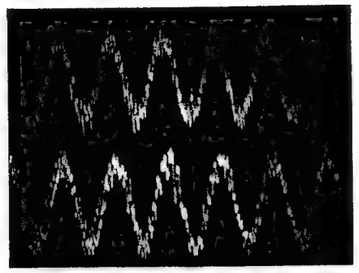
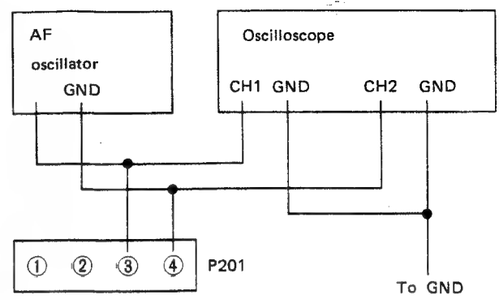
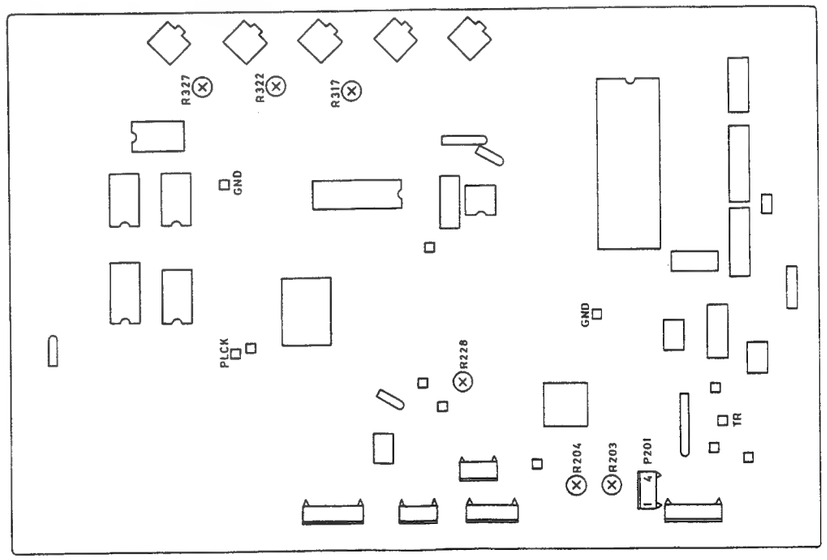


Photo 3
Range:Vertical:0.2V/div.
Holizontal:0.5mS/div.



NOTE:After adjustment of servo circuit,connect the five opto. fiver cables and Analog circuit pc board ass'y.



2.Opto. transmitter circuit adjustment
Adjust after switching on more than 2 minutes.

2-1 Bit clock adjustment
Connect the oscilloscope to test point BCK.
Adjust R327 so that the duty ratio of the waveform is 4.5:5.5.
NOTE:Adjust R327 via the opening on the side bracket L side.

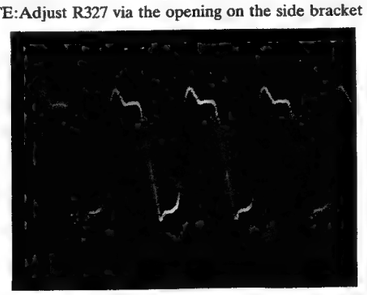
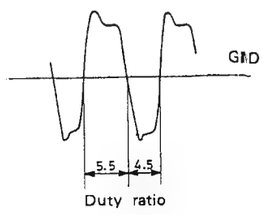


Photo 4
Range:Vertical:1V/div.
Holizontal:50nS/div.



2-2 Word clock (WCK) adjustment
Put the unit into the stop mode.
Connect the oscilloscope to test points WCK and BCK.
Adjust R411 so that there is a 50ns gap between the leading edge of WCK and that of BCK. (The BCK leading edge should come 50ns after the leading edge of WCK.)
(Refer photo 5)

Photo 5
Range: Vertical: 1V/div.
Holizontal: 50nS/div.
Synchronize with WCK.

Connect the oscilloscope to test point DAL.
Load the test disc into the unit and play track 2.
Adjust R317 so that the data waveform crosses the waveform immediately before its peak. (Refer photo 6)

Connect the oscilloscope to test point DAR.
Load the test disc into the unit and play track 2.
As above, adjust R322 so that the data waveform crosses the waveform immediately before its peak. (Refer photo 6)

Note: Adjust R317 and R322 via the opening on the side bracket L side.

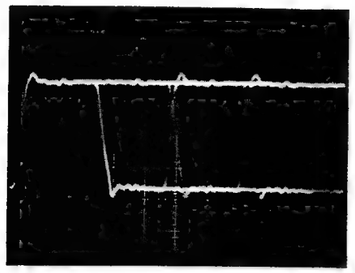


Photo 6
Range: Vertical: 1V/div.
Holizontal: 50nS/div.

3.Muting level adjustment
Connect the AC voltmeter to test point TP411 (VMU).
The voltage when the unit is in the stop mode is V3.
The voltage while track 1 of the test disc is playing is V4.
Next, connect the AC voltmeter to test point TP412 VMR.
Adjust R409 so that the voltage is (V3+V4)/2.

4.Emphasis level adjustment
Connect the AC voltmeter to test point TP413 (VEM).
Load the test disc into the unit.
The voltage while track 1 of the test disc is playing is V5.
Next, the voltage while track 2 of the test disc is playing is V6.
Next, connect the AC voltmeter to pin 6 of Q407.
Adjust R418 so that the voltage is (V5+V6)/2.

5.D/A converter adjustment
5-1.Audio output level adjustment
Connect the AC voltmeter to test point TP403.
Adjust R433 so that the voltage is 10.00±0.03V.
Connect a 2needle AC voltmeter to the audio output (FIXED) terminals.
Play the track 2 of test disc.
Adjust R434 so that the left and right channel output levels are the same.
5-2.B1~B4 adjustment
Connect the distortion analyzer to the audio output (FIXED) terminals.
Play the track 2 of test disc.
Step 1 Adjust R439/R440 so that the distortion analyzer reading is minimum. (Refer photo 7)
Step 2 Adjust R435/R436 so that the distortion analyzer reading is minimum. (Refer photo 8)
Step 3 Adjust R443/R444 so that the distortion analyzer reading is minimum. (Refer photo 9)
Step 4 Adjust R447/R448 so that the distortion analyzer reading is minimum. (Refer photo 10)

Step 5 Repeat the steps 1,2,3 and 4 until no further adjustment is necessary.

Note 1: Synchronizing the distortion waveform with the signal on the oscilloscope makes it easier to observe.
2: Turn both 400Hz HPF and 30kHz LPF on the distortion analyzer ON.

Reference: The audio output offset voltage (voltage at R511, R512 adjustment point arrows) in the stop mode should be less than 10mV.

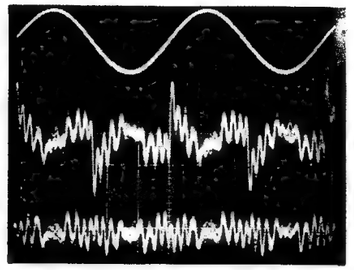


Photo 7 Output waveform
Distrotion ratio: 0.00668%
0.00324%

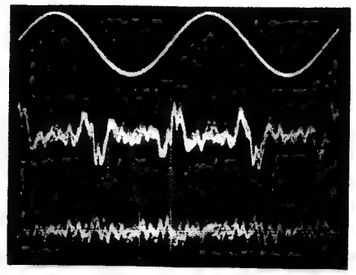


Photo 8 Output waveform
Distrotion ratio: 0.00435%
0.00213%

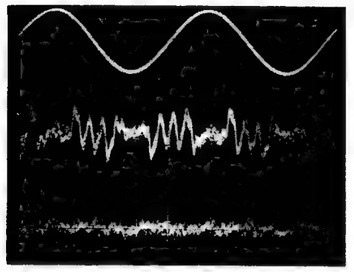


Photo 9 Output waveform
Distrotion ratio: 0.00362%
0.00186%

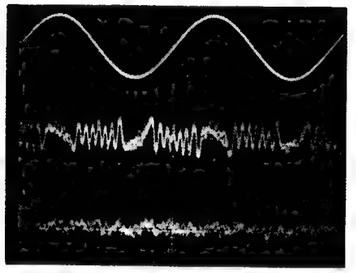
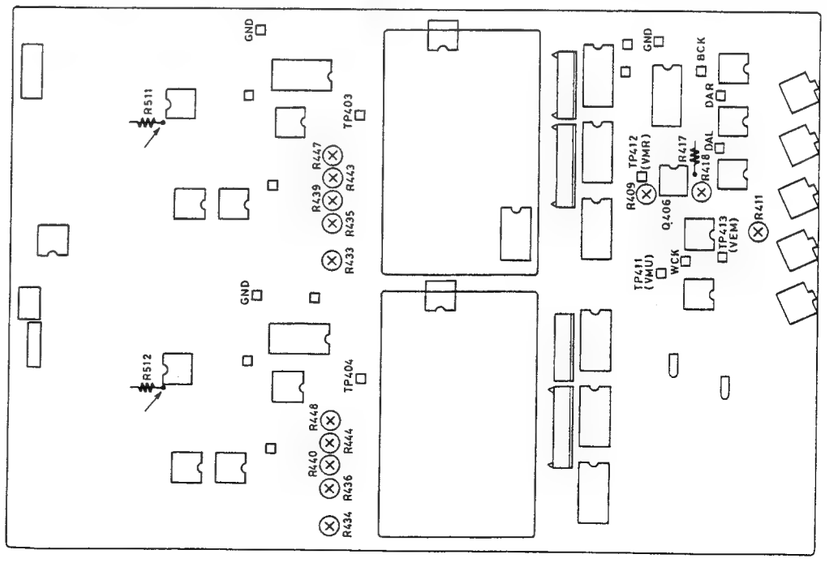
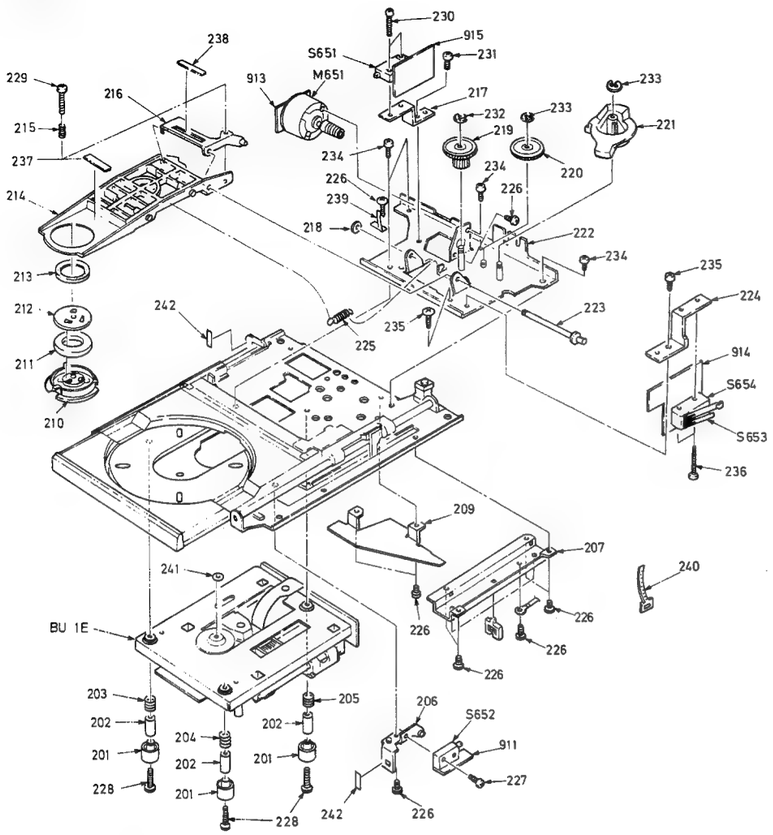


Photo 10 Output waveform
Distrotion ratio: 0.00335%
0.00166%

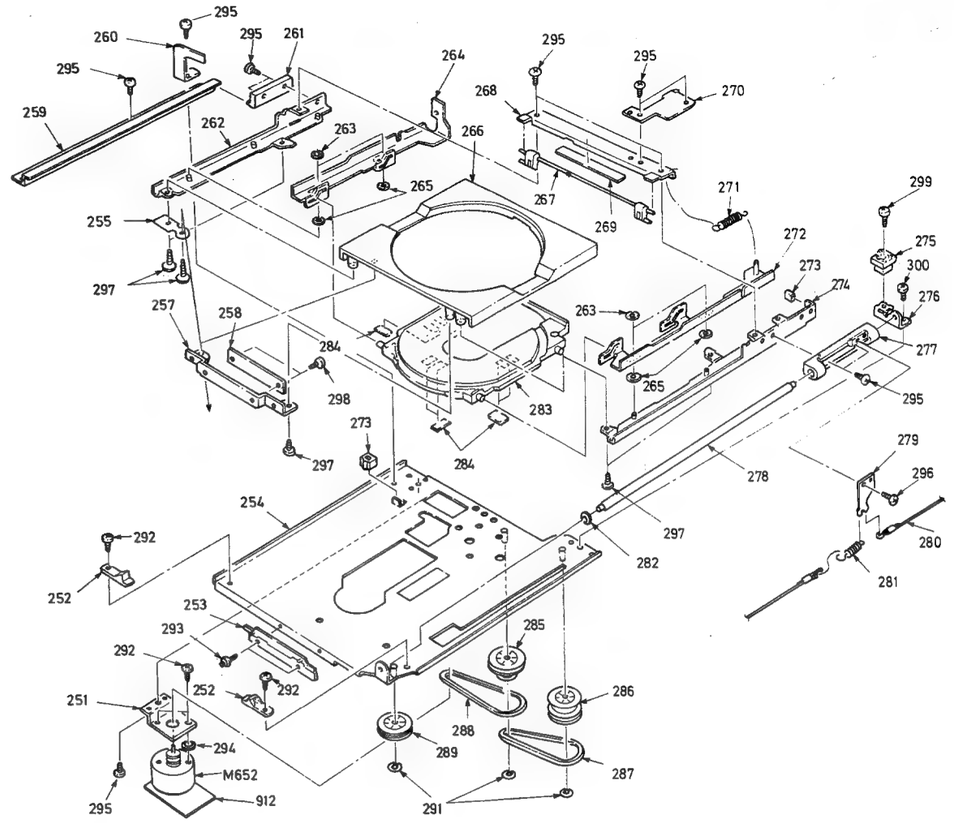


MECHANISM EXPLODED VIEW



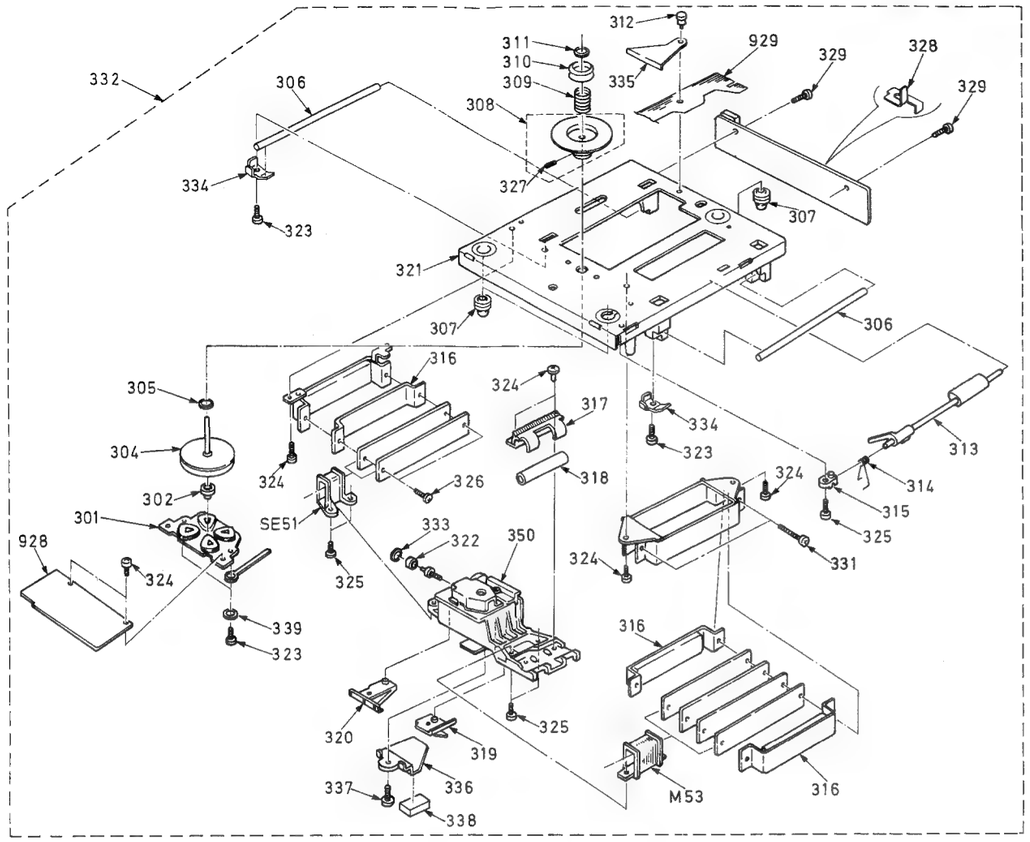
REF.NO.	PART NO.	DESCRIPTION
201	27190580	Holder
202	27270225	Spacer
203	27180367	Spring G
204	27180368	Spring S
205	27180369	Spring B
206	27141170	Bracket, switch C
207	27130509	Bracket RO
209	27141171	Bracket, belt
210	27301041	Cap CH
211	27301042	Magnet
212	27301043	York
214	27301044	Arm ass'y
215	27180370	Spring
216	27301045	Adjustment plate
217	27141172	Bracket, switch D
218	27270227	Washer
219	27301046	Gear A
220	27301047	Gear B
221	27301048	Cam gear
222	27100148	Sub-chassis
223	27260238	Shaft arm
224	27141192	Bracket, switch C
225	27180371	Spring arm
226	82542603	2.6B+3F(BC), Binding screw
227	82112608	2.6P+8F, Pan head screw

REF.NO.	PART NO.	DESCRIPTION
228	82543020	3B+20FN(BC), Binding screw
229	82542616	2.6B+16F(BC), Binding screw
230	834126107	2.6TTS+10S, Tapping screw
231	801393	3SMPSW+5FN, Sems screw
232	8930502	E-5, Circlip
233	8930301S	ES-3S, Circlip
234	834130057	3TTS+5S, Tapping screw
235	82543003	3B+3FN(BC), Binding screw
236	82112314	2.3P+14F,Pan head screw
237	27301061	Sheet C
238	27301062	Sheet B
239	27180372	Spring, ground
240	260208	Binder
241	27270226	Spacer D
242	28140783	Cushion
911	25133171	NCSW-3171, Pc board
913	25133173	NCETC-3173, Pc board
914	25133174	NCSW-3174, Pc board
915	25133175	NCSW-3175, Pc board
M651	24502223	Motor ass'y
S651	25065329	NMS-1216, Microswitch
S652	25065329	NMS-1216, Microswitch
S653	25065330	NMS-1217, Microswitch
S654	25065331	NMS-1218, Microswitch



REF.NO.	PART NO.	DESCRIPTION
251	27141173	Bracket, motor
252	27267524	Guide
253	27141193	Holding bracket ass'y
254	27100149	Chassis
255	27141174	Bracket, ground
257	27141175	Bracket L
258	27262465	Plate
259	27141176	Bracket, guide
260	27141177	Bracket, holder
261	27267526	Guide S
262	27141194	Mounting bracket L ass'y
263	27270227	Washer
264	27301049	Cam plate L
265	27270229	Poly washer
266	27301051	Disc table
267	27301052	Lever
268	27141178	Bracket,table
269	27301063	Sheet S
270	27141179	Bracket W
271	27180373	Spring D
272	27301050	Cam plate R
273	27301066	Cushion rubber
274	27141180	Bracket R
275	27301053	Stopper T
276	27141181	Bracket, shaft

REF.NO.	PART NO.	DESCRIPTION
277	27267525	Guide, shaft
278	27260239	Shaft
279	27141182	Bracket RO
280	273907	Rope
281	27180374	Spring RO
282	28140784	Cushion A
283	27301054	Disc holder ass'y
284	27301064	Sheet
285	27301055	Pulley A
286	27301056	Pulley C
287	27301067	Belt A
288	27301068	Belt B
289	27301057	Pulley B
291	8930301S	Circlip
292	82542603	Screw
293	801394	+PSW2.6 x 8, Special screw
295	834130057	3TTS+5S, Tapping screw
296	83812055	2.6STB+5B, Tapping screw
297	838130082	3STB+8BQ, Tapping screw
298	838126057	2.6TTB+5S, Tapping screw
299	838130167	3TTB+16S,Tapping screw
300	801393	3SMPSW+5FN, Sems screw
912	25133172	NCETC-3172, Pc board
M652	24502224	Motor ass'y



REF.NO.	PART NO.	DESCRIPTION
BU-1	24506746	CD drive unit
301	27141183	Bracket M
302	27301058	Thrust holder
304	27301059	Rotor ass'y
305	27270228	3,Poly washer
306	27260240	Shaft PU
307	27301069	Cushion rubber
308	27301060	Turntable
309	27180375	Spring
310	27301065	Center ring cap
311	27270227	Washer
312	880016	NRP-335, Rivert
313	27301070	Locking lever
314	27180376	Spring RL
315	27190586	Holder ROD
316	27301071	Liner york ass'y
317	27190581	Holder BR
318	27301072	Bearing
319	27301073	Lead wire holder A
320	27301074	Lead wire holder B

REF.NO.	PART NO.	DESCRIPTION
321	27100150	Chassis PU
322	27301075	Ball bearing
323	833426082	2.6STP+8BQ, Tapping screw
324	82542604	2.6B+4F(BC), Binding screw
325	82542605	2.6B+5F(BC), Binding screw
326	838126087	2.6TTB+8S,Tapping screw
327	801395	2.6×3WP,Screw
329	838126107	2.6TTB+10S, Tapping screw
331	838126167	2.6TTB+16S, Tapping screw
333	8930232	E-2.3Zn, Circlip
334	27141184	Bracket SL
335	27301076	Holder PB
336	27141185	Bracket PB
337	82543006	3B+6FN(BC), Binding screw
338	28140785	Cushion PB
339	870142	W2.6×7F, Washer
928	25133176	NCETC-3176, Pc board
929	25133177	NCETC-3177A,Flexible pc board
M53	24502225	Coil D
SE51	24502226	Coil S

CHASSIS- PARTS LIST

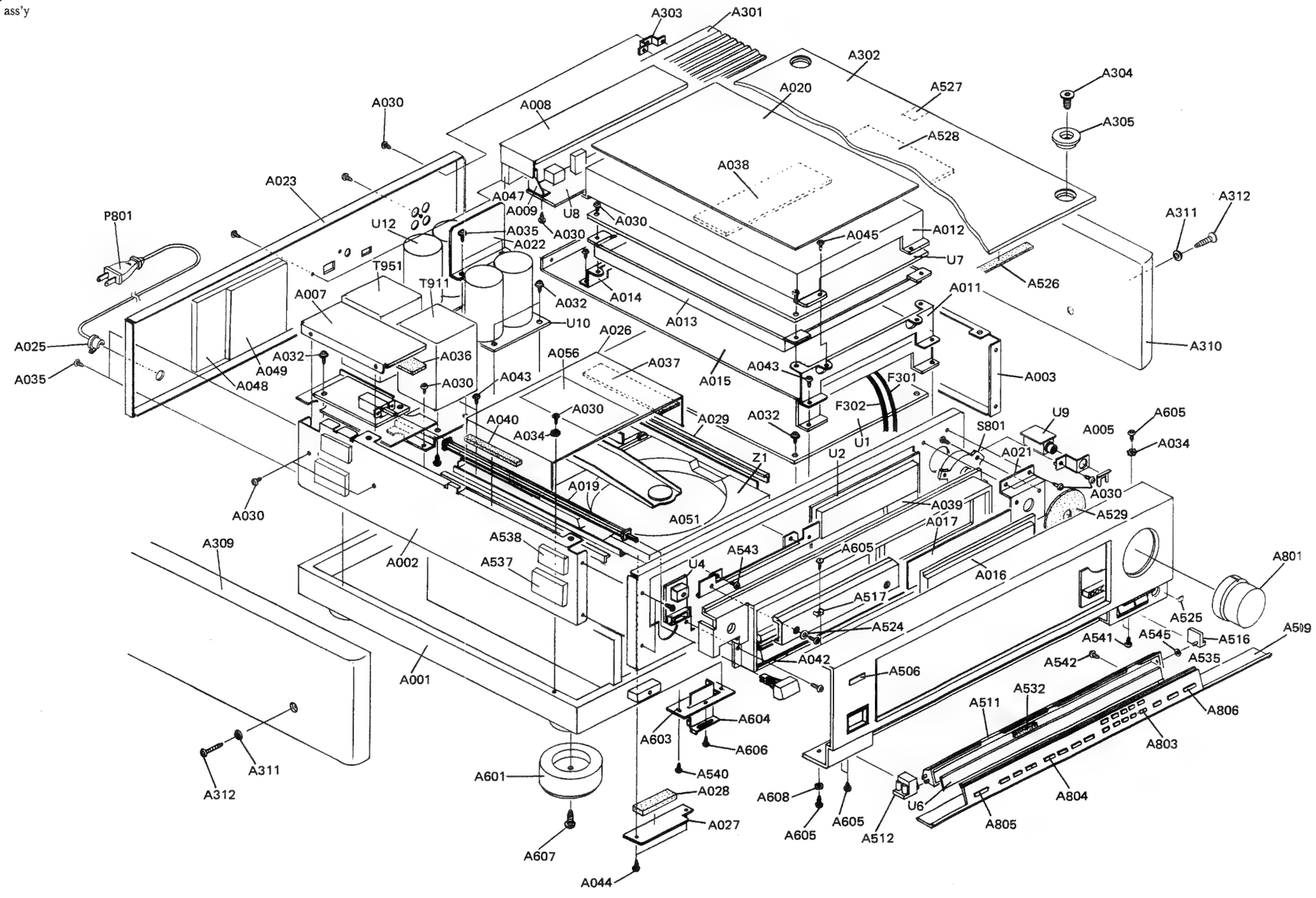
REF.NO.	PART NO.	DESCRIPTION
A001	27100147A	Chassis
A002	27115231B	Side bracket L
A003	27115232B	Side bracket R
A004	27110385A	Front bracket
A005	27141165	Bracket,headphone
A006	27130505A	Bracket,power transformer
A007	27150255	Shielded plate,power
A008	27150242	Shielded plate
A009	27140881-1	Bracket S
A010	27190651	Holder ass'y
A011	27130510	Bracket,pc board
A012	27190588	Holder,lid
A013	27190589	Holder,bottom
A014	27130525	Bracket B
A015	27150246	Shielded plate
A016	28191442	Clear plate
A017	28133201	Back plate
A019	27273065	Joint
A020	27262470	Plate
A021	27141236A	Bracket SH
A022	27150249	Shielded plate
A023	27121142	Back panel
A025	27300750	⚠ Strainrelief
A026	27150247	Shielded plate CD
A027	27141228	Bracket CD
A028	28140793	Cushion
A029	27270243	Spacer
A030	834430068	3TTS+6B(BC),Tapping screw
A032	831130088	3TTW+8B,Tapping screw
A033	830440089	4TTC+8C(BC),Tapping screw
A034	87313006	M-3B,Toothed washer
A035	801230	3STS+8BQ(BC),Tapping screw
A036	28140814	t1.5×55×30,Cushion
A037	28140815	t1.5×100×30,Cushion
A038	28140816	t1.5×160×80,Cushion
A039	28140853	Cushion
A040	28140817	t4.5×55×10,Cushion
A041	28175149	Insulated plate
A042	29110050	12×340,Aluminium tape
A043	834430088	3TTS+8B(BC),Tapping screw
A044	838426088	2.6TTB+8B(BC),Tapping screw
A045	831430088	3TTW+8B(BC),Tapping screw
A046	880011	NRP-355,Rivert
A047	28140897	t12×35×180, Cushion
A048	28140898	t1.5×140×70,Cushion
A049	28140899	t8×70×70,Cushion
A051	28140820	Cushion
A052	28140821	Cushion,disc
A055	29355142	Caution label
A056	29360911	Label,LASER 3
A301	28145124	Top panel B
A302	28145125A	Top panel F
A303	27141153A	Bracket T
A304	801403	5×12(BC),Special screw
A305	27265159	Decoration ring F
A306	834430068	3TTS+6B(BC),Tapping screw
A308	28140812	t5×25×300,Cushion
A309	1H046602	Side panel L ass'y
A310	1H046603	Side panel R ass'y
A311	870086	4×12(BC),Special washer
A312	836440303	4STV+30CQ(BC),Special screw
A313	87314006	M-4B,Toothed washer

REF.NO.	PART NO.	DESCRIPTION
A501	1H047121	Front panel ass'y
A506	28135125	Badge
A509	27210972	Tray panel
A510	27267521	Guide,knob
A511	28400361A	Lid
A512	1H031702	Bearing L ass'y
A516	27301040A	Bearing R
A517	27141268A	Bracket,ground
A519	27210907	Front panel,door
A520	27141169A	Bracket,door
A524	27270254	Spacer
A525	28140804	Cushion
A526	28140755	t0.5×6×165,Cushion
A527	28140756	t0.5×30×30,Cushion
A528	28140672A	t1.5×158×190,Cushion
A529	28140126	t0.5×53, Cushion
A532	28140827	.6×10×40, Cushion
A533	28140828	t1×4×10,Cushion
A534	28140829	t1×5×40,Cushion
A535	29110075	Copper tape
A536	28140900	t0.5×6×15, Cushion
A537	27270260	t4×15×15,Spacer
A538	27270261	t5.5×15×15,Spacer
A540	834430068	3TTS+6B(BC),Tapping screw
A541	835430065	3STF+6B(BC),Flat head tapping screw
A542	833430080	3TTP+8P(BC),Tapping screw
A543	82142604	2.6P+4F(BC),Pan head screw
A544	84643008	3HSB×8FN(BC),Hexagonal head bolt
A545	870071	WW6,Wave washer
A601	27175171A	Leg
A603	27141168	Bracket D
A604	27141167	Bracket ST
A605	834430068	3TTS+6B(BC),Tapping screw
A606	834230108	3TTS+10B(Ni),Nickel screw
A607	834440168	4TTS+16B(BC),Tapping screw
A608	87314006	M-4B,Toothed washer
A801	28323185A	Knob SH
A802	28323186A	Knob POWER
A803	28323187	Knob TEN
A804	28323188-1	Knob PE
A805	28323188-2	Knob D
A806	28323188-3	Knob S
F301-F305	241058	FCPA00001AF,Photo coupler
P801	253148 or 253150	⚠ AS-CEE,Power supply cord
S801	25000004	SRGP-S-001,Encoder
SC151	2000766A	NSAS-4P722,Socket
SC651	2000767A	NSAS-7P723,Socket
T911	2300296	⚠ NPT-981G,Power transformer
T951	2300300	⚠ NPT-982G,Power transformer
U1	1H046560-3A	NADG-3160-3a,Digital circuit pc board ass'y
U2	1H046561-2	NADIS-3161-2,FL tube circuit pc board ass'y
U3	1H046530-2	NADIS-3230-2,Level indicator pc board ass'y

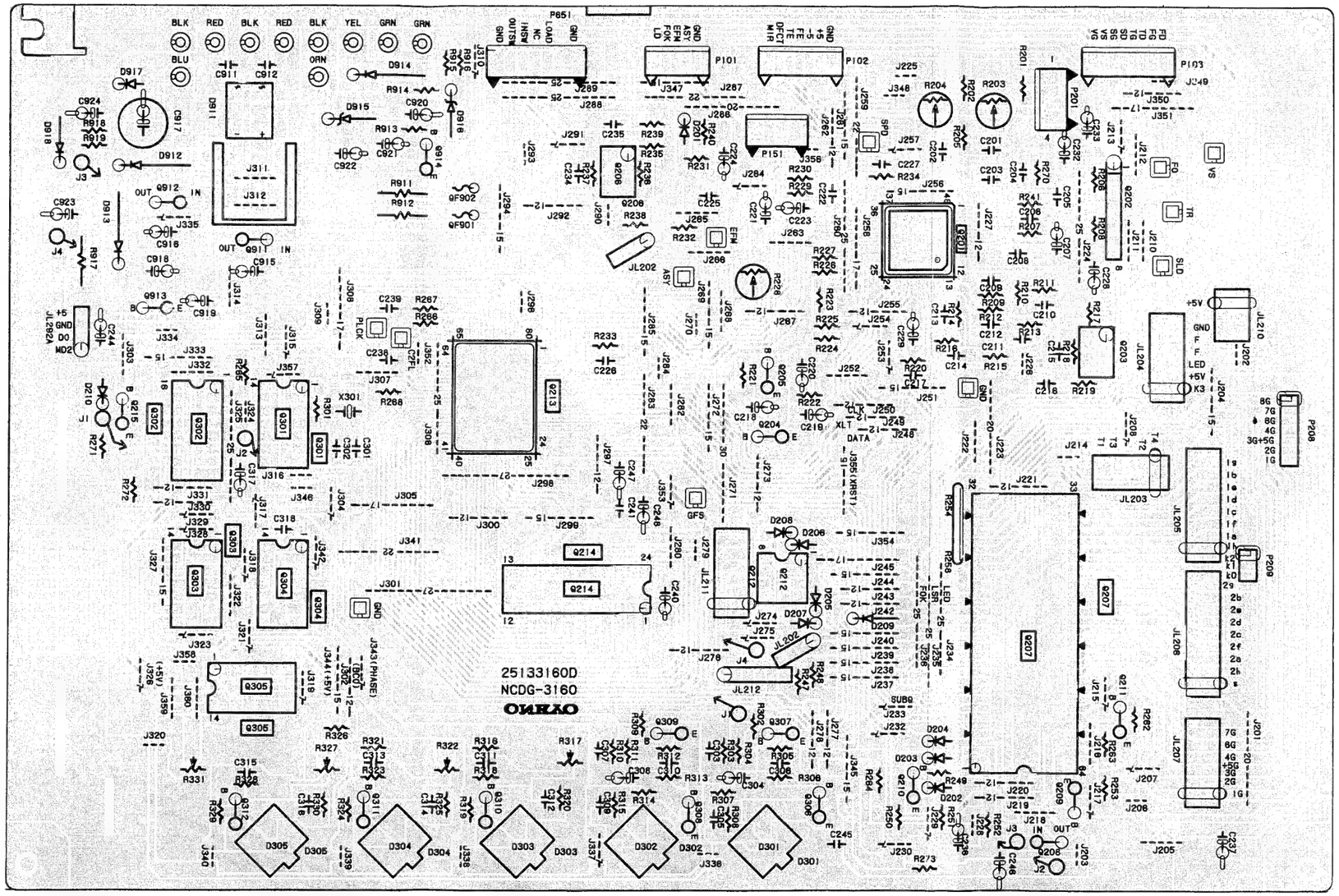
CHASSIS-EXPLODED VIEW

REF.NO.	PART NO.	DESCRIPTION
U4	1H046563-2	NADIS-3163-2,Remote control pc board ass'y
U5	1H046564-2	NAPS-3164-2,Power supply circuit pc board ass'y
U6	1H046565-2	NASW-3165-2,Operation switch pc board ass'y
U7	1H046566-3	NAAF-3166-3,Analog circuit pc board ass'y
U8	1H046567-2	NAAF-3167-2,Output terminal pc board ass'y
U9	1H046568-2	NAAF-3168-2,Headphone terminal pc board ass'y
U10	1H046570-2	NAAF-3170-2,Power supply pc board ass'y
U12	1H046506-2	NAAF-3206-2,Power supply pc board ass'y
W1	260208	Binder
Z1	24506735	CD mechanism ass'y

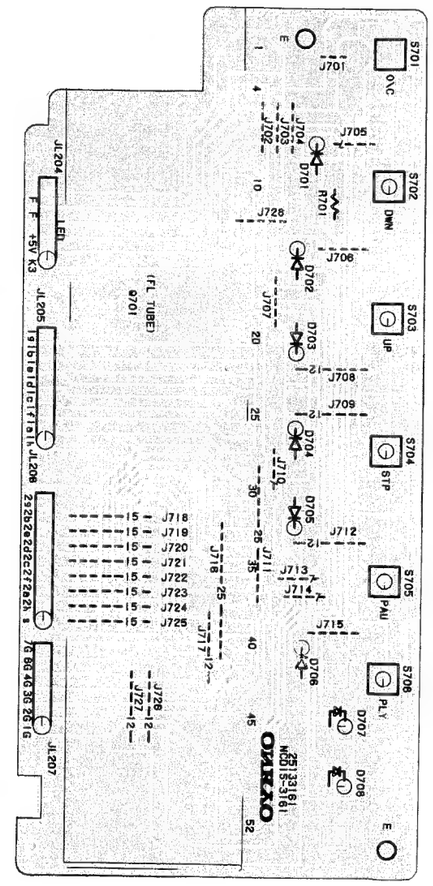
NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PART NUMBER SPECIFIED.



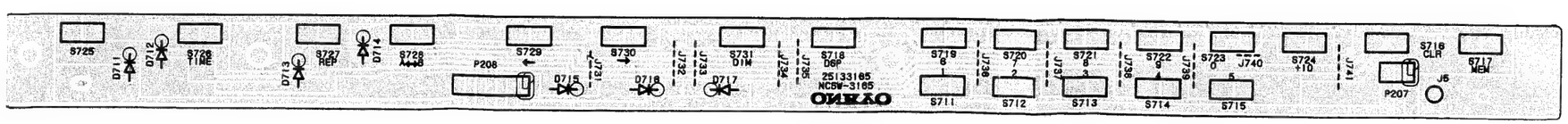
PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE



DIGITAL CIRCUIT PC BOARD



FL TUBE CIRCUIT PC BOARD



OPERATION SWITCH PC BOARD

PRINTED CIRCUIT BOARD – PARTS LIST

DIGITAL CIRCUIT PC BOARD (NADG-3160-3A)

CIRCUIT NO.	PART NO.	DESCRIPTION
	ICs	
Q201	22240030	CXA1082AQ
Q202	22240036	STA341M
Q203,Q206	22240033	LA6500
Q207	22240110	CXP5016H-229S
Q208	22240018	M51943ASL
Q212	222963	LB1630
Q213	22240129	CXD1125QZ
Q214	22240118	LC3517AS-15
Q215	221282	DTC144ES
Q301	222755	74HCU04P
Q302	22240176	YM3414
Q303	222740025	74HC02P
Q304	222740745	74HC74P
Q305	222740865	74HC86P
Q911	222780052	78M05
Q912	222790053	79L05
Q913	222780123	78L12
	Transistors	
Q209	2212600	DTA124ES
Q210	2211454 or	2SA1015-Y or
	2211455	2SA1015-GR
Q211	2211254 or	2SC1815-Y or
	2211255	2SC1815-GR
Q306,Q308	2211455	2SA1015-GR
Q307	2211255	2SC1815-GR
Q309-Q312	2211255	2SC1815-GR
Q914	2211643 or	2SA965-O or
	2211644	2SA965-Y
	Diodes	
D201-D208	223163	1SS133
D209,D211	223150 or	US1040 or
	223145	1S2076
D210	223163	1SS133
D911	22380018	DB103
D912-D914	223880 or	GP101N4003 or
	223896	1N4003
D915	224652702	HZ27E-B2
D916,D918	224650511	HZ5.1E-B1
D917	223163	1SS133
	Photo couplers	
D301-D305	24120013	FCPA00002AT
	X'tal	
X301	3010112	KD6586FFB
	Capacitors	
C207,C219	354780479	4.7μF,50V,Elect.
C221	354742209	22μF,16V,Elect.
C223,C224	354784799	0.47μF,50V,Elect.
C228,C229	354742209	22μF,16V,Elect.
C232,C233	354744709	47μF,16V,Elect.
C236	354742209	22μF,16V,Elect.
C237	354762209	22μF,35V,Elect.
C240,C248	354744709	47μF,16V,Elect.
C244	354742209	22μF,16V,Elect.
C246	354741009	10μF,16V,Elect.
C308	354781099	0.1μF,50V,Elect.
C317	354744709	47μF,16V,Elect.
C915,C916	354744709	47μF,16V,Elect.
C917,C918	354754719	470μF,25V,Elect.
C919,C923	354742209	22μF,16V,Elect.
C920	354761019	100μF,35V,Elect.
C921,C922	354761009	10μF,35V,Elect.
C924	354744709	47μF,16V,Elect.

CIRCUIT NO.	PART NO.	DESCRIPTION
	Resistors	
R203,R204	5210066	N06HR22KBD,Semi-fixed
R228	5210060	N06HR2.2KBD,Semi-fixed
R254-R261	49163472408	4.7K×8,1/8W,Network
R317,R322	5210135	N06HR2.2KBE,Semi-fixed
R327	5210135	N06HR2.2KBE,Semi-fixed
R911,R912	442521004	10ohm,1/2W,Metal oxide film
R917	441520474	4.7ohm,1/2W,Metal oxide film
	Plugs	
P101	25055149	NPLG-5P133
P102	25055151	NPLG-7P135
P103	25055152	NPLG-8P136
P151,P201	25055045	NPLG-4P33
P651	25055137	NPLG-7P21
	Sockets	
JL203,JL204	25050269	NSCT-5P97
JL205	25050272	NSCT-8P100
JL206	25050273	NSCT-9P101
JL207	25050270	NSCT-6P98
SC208b	2000791A	NSAS-7P747
SC209b	2000790A	NSAS-3P746
JL210	25050267	NSCT-3P95
JL211	25050270	NSCT-6P98
	Radiator	
	27160029-1	RAD-07B
	Screw	
	82143006	3P+6FN(BC),Pan head screw
	Bracket	
	27141059	Ground
	Fuses	
QF901,QF902	252112	ICPN15,IC protector

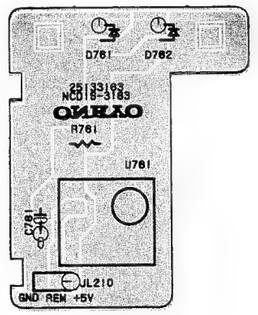
OPERATION SWITCH PC BOARD (NASW-3165-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
D711-D717	223163	1SS133,Diodes
S711-S731	25035570	NPS-111-S532,Push switches
SC209a	2000770A	NSAS-3P726,Socket
SC208a	2000771A	NSAS-7P727,Socket

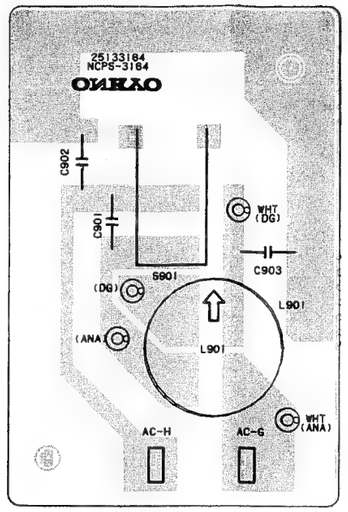
FL TUBE CIRCUIT PC BOARD (NADIS-3161-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
	Fluorescent tube	
Q701	212051	FIP13JM7
	Diodes	
D701-D706	223163	1SS133
	L.E.Ds	
D707,D708	225141	SEL2213C
	Switches	
S701-S706	25035548	NPS-111-S510
	Holder	
	27190454A	L.E.D
	Cushion	
	28140780	

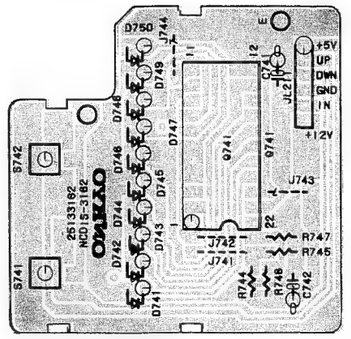
PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE



REMOTE CONTROL
CIRCUIT PC BOARD



POWER SUPPLY
CIRCUIT PC BOARD



LEVEL INDICATOR
CIRCUIT PC BOARD

REMOTE CONTROL CIRCUIT PC BOARD (NADIS-3163-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
U701	241068	BX1407,IC
D761,D762	225142	SEL2913K,L.E.Ds
C761	355742209	22μF,16V,Elect. capacitor
	27190454A	Holder,L.E.D

POWER SUPPLY CIRCUIT PC BOARD (NAPS-3164-2)

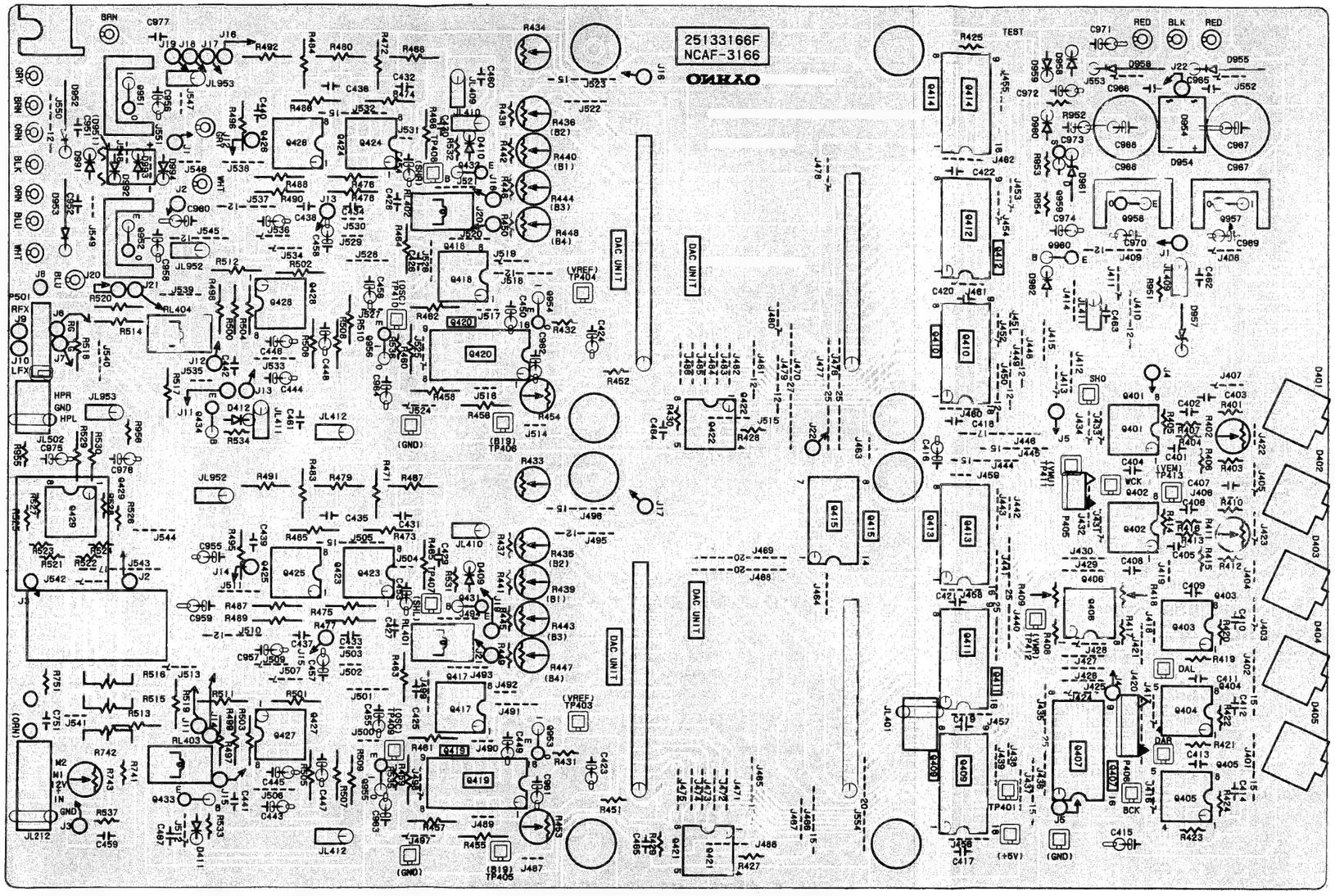
CIRCUIT NO.	PART NO.	DESCRIPTION
C901	3500065A	⚠ DE7150F103PCSA,Capacitor IS
L901	231051	⚠ NCH-1092,Line filter
S901	25035550	⚠ NPS-111-L512P,Power switch
	27300601	⚠ Cover for C901
	25060092	⚠ Terminal

LEVEL INDICATOR CIRCUIT PC BOARD (NADIS-3230-2)

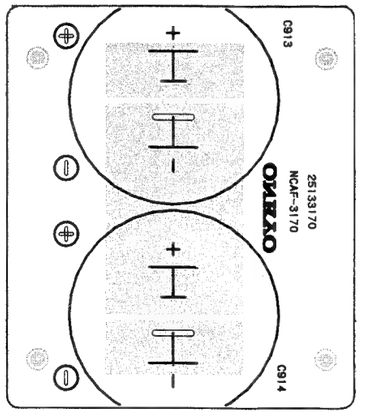
CIRCUIT NO.	PART NO.	DESCRIPTION
	IC	
Q741	22240122	IR2406G
	L.E.Ds	
D741-D750	225141	SEL2213C
	Capacitor	
C742	354742209	22μF,16V,Elect.
	Switch	
S741,S742	25035548	NPS-111-S510,Push
	Holder	
	27190579	L.E.D

NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PART NUMBER SPECIFIED.

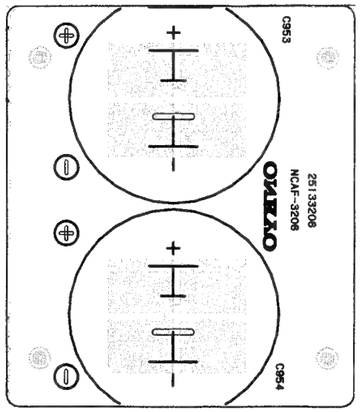
PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE



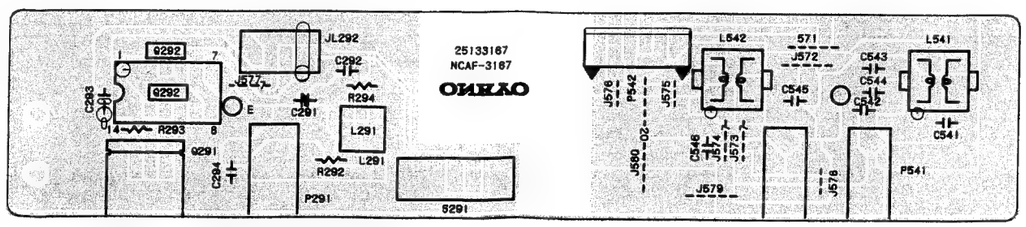
ANALOG CIRCUIT PC BOARD



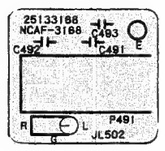
POWER SUPPLY CIRCUIT PC BOARD



POWER SUPPLY CIRCUIT PC BOARD



OUTPUT TEMINAL PC BOARD



HEADPHONE TERMINAL PC BOARD

CIRCUIT PC BOARD(NAAF-3166-3)

PART NO.	DESCRIPTION
DAC ass'y	
1H046700	NAHC-3169
ICs	
22240035	NJM592D8
222465	NJM4558D
22240119	74HC4050P
222745955	74HC595P
222755	74HCU04P
22240120	μPC813C
222717	μPD4053BC
226027	HCPL-2601
222902	NJM5532D-D
222654	NJM4556D
222780155MIT	M5F78M15L
222790155MIT	M5F79M15L
222780053	78L05
222790053	79L05
222780055MIT	M5F78M05L
222790055MIT	M5F79M05L
Transistors	
2211255	2SC1815-GR
2211945	2SK246-GR
221282	DTC144ES
Photo couplers	
2410571	FCPA00001ARA
Diodes	
223163	1SS133
22380013	RDF02M
224650511	HZ5.1EB1
223163	1SS133
22460822 or	HZ8.2EB2 or
2243192	MTZ8.2B
223163	1SS133
Capacitors	
354744709	47μF,16V,Elect.
372123314	330pF ±5%,50V,Styrole
372123324	3300pF±5%,50V,Styrole
372122224	2200pF±5%,50V,Styrole
372122224	2200pF±5%,50V,Styrole
372123314	330pF ±5%,50V,Styrole
391242207	22μF,16V,Elect.
391262217	220μF,35V,Elect.
379121045	0.1μF±10%,50V,Plastic
391242207	22μF,16V,Elect.
391262217	220μF,35V,Elect.
391242207	220μF,16V,Elect.
354743329	3300μF,16V,Elect.
354742229	2200μF,16V,Elect.
354742209	22μF,16V,Elect.
354780479	4.7μF,50V,Elect.
354784799	0.47μF,50V.Elect.
354742209	22μF,16V,Elect.
354742219	220μF,16V,Elect.
375104745	0.47μF±10%,125V.Plastic
379121525	1500pF±10%,50V,Plastic
Resistors	
5210062	N06HR4.7KBD,Semi-fixed
5210066	N06HR22KBD,Semi-fixed
5210064	N06HR10KBD,Semi-fixed
5210070	N06HR100KBD,Semi-fixed
5210070	N06HR100KBD,Semi-fixed
5210070	N06HR100KBD,Semi-fixed
5210070	N06HR100KBD,Semi-fixed

CIRCUIT NO.	PART NO.	DESCRIPTION
R515,R516	5104218	N16RTL20KA10M,Variable resistor
	Relaies	
RL401-RL404	25065327	NRL-1P0.5A-DC05-044
	Sockets	
JL401	25050267	NSCT-3P95
SC501	2000772A	NSAS-6P728
JL502	25050267	NSCT-3P95
JL212	25050269	NSCT-5P97
	Radiators	
	27160145	RAD-51
	Screws	
	82143006	3P+6FN(BC),Pan head

OUTPUT TERMINAL PC BOARD(NAAF-3167-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
Q291	24120019	TOTX-175,Opto. module
Q292	222755	74HCU04P,IC
L291	232143	NSRF-2047,RF coil
C291	352942206	22μF,16V,Non-polar elect.capacitor
C293	354744709	47μF,16V,Elect.capacitor
C541,C542	372522214	220pF ±5%,50V,Styrole capacitors
C545,C546	372521514	150pF ±5%,50V,Styrole capacitors
P291	25045220	NPJ-1PDOR97,Digital output terminal
P541	25045236	NPJ-4PDBL110,Audio output terminal
JL292	25050268	NSCT-4P96,Socket
P542	25055037	NPLG-6P28,Plug
S291	25065286	NSS-22112,Slide switch

HEADPHONE TERMINAL PC BOARD(NAAF-3168-1)

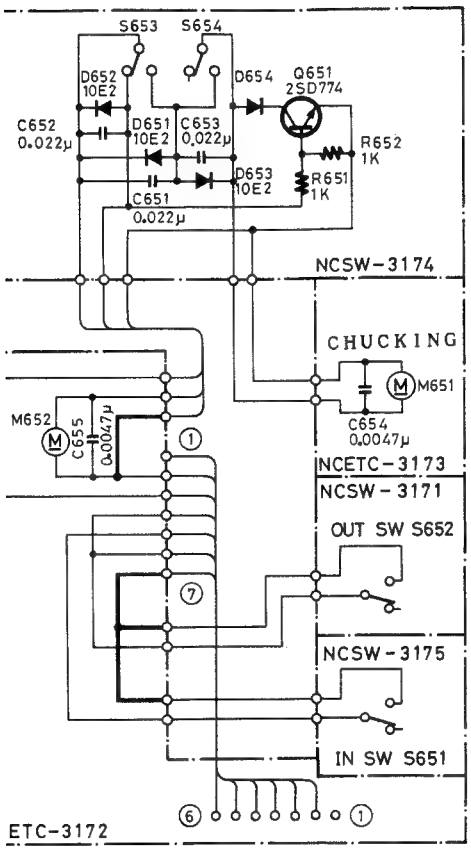
CIRCUIT NO.	PART NO.	DESCRIPTION
P491	25045221	HLJ0540-01-410,Stereo headphone terminal

POWER SUPPLY CIRCUIT PC BOARDS(NAAF-3170-2/3206-2

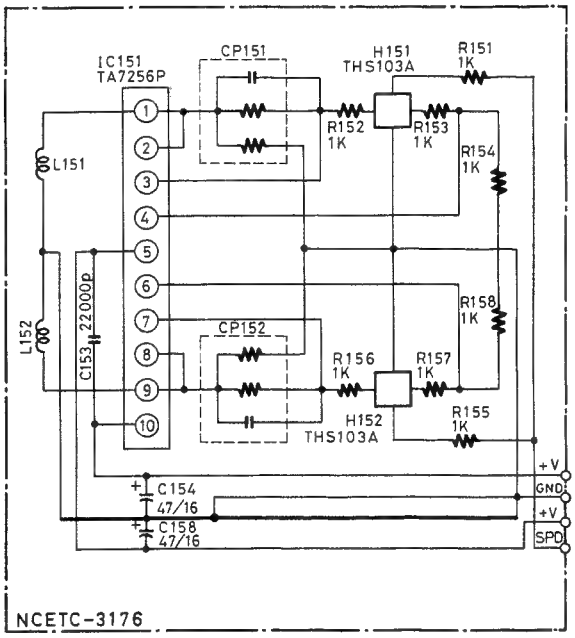
CIRCUIT NO.	PART NO.	DESCRIPTION
C913,C914	3500102	10,000μF,50V,Elect.capacitors
C953,C954	3500102	10,000μF,50V,Elect.capacitors

MATIC DIAGRAM

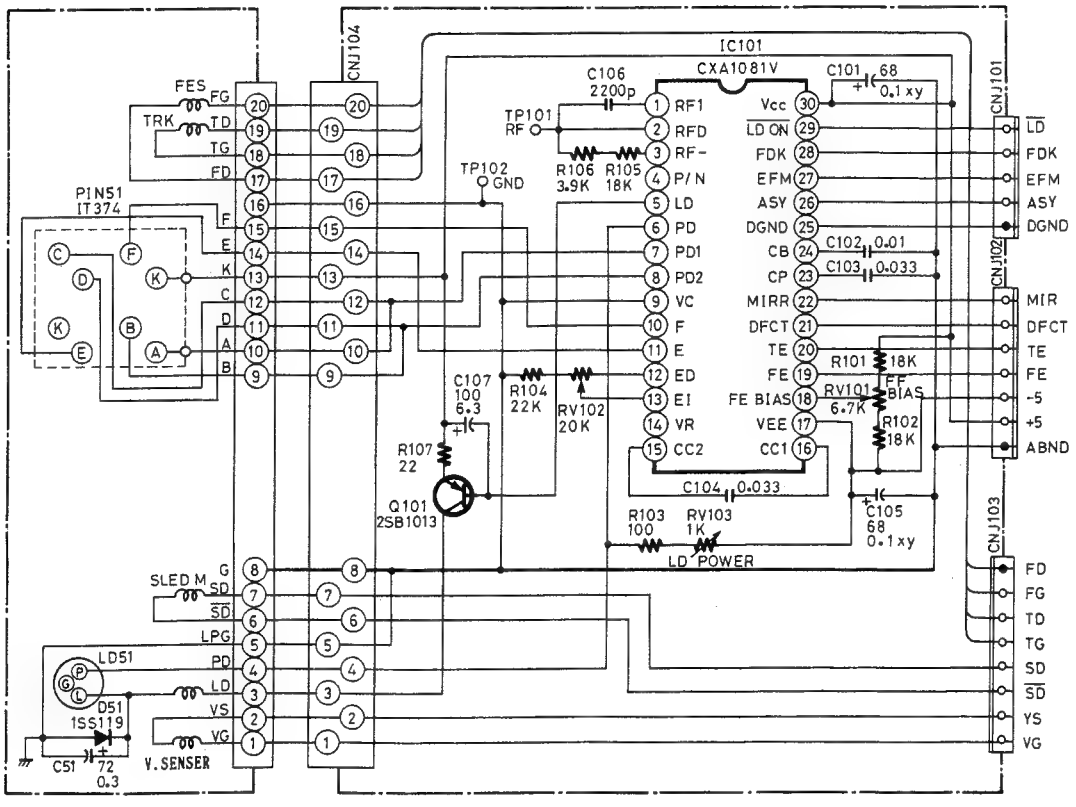
LOADING MOTOR BOARD



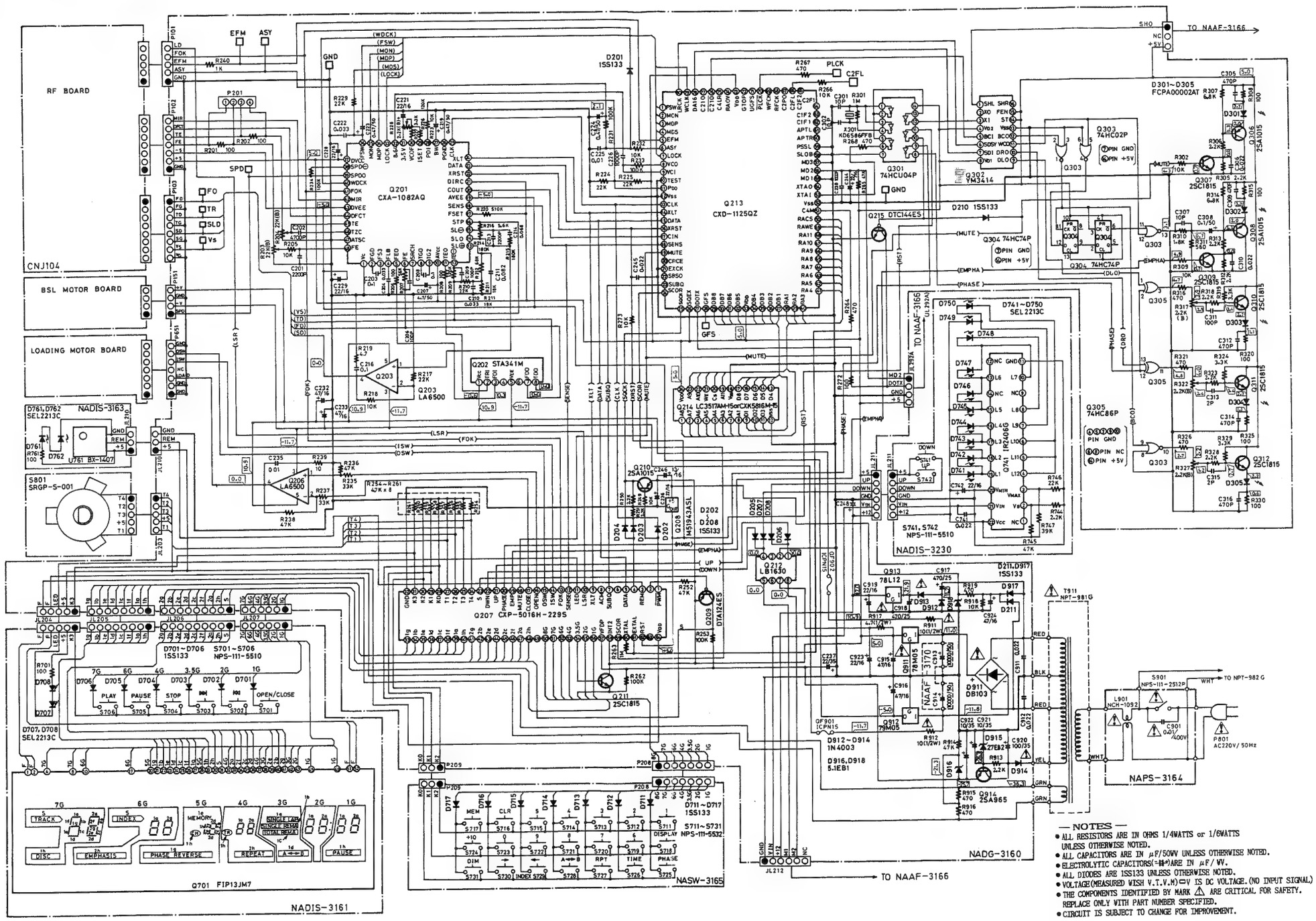
BSL MOTOR BOARD



RF BOARD



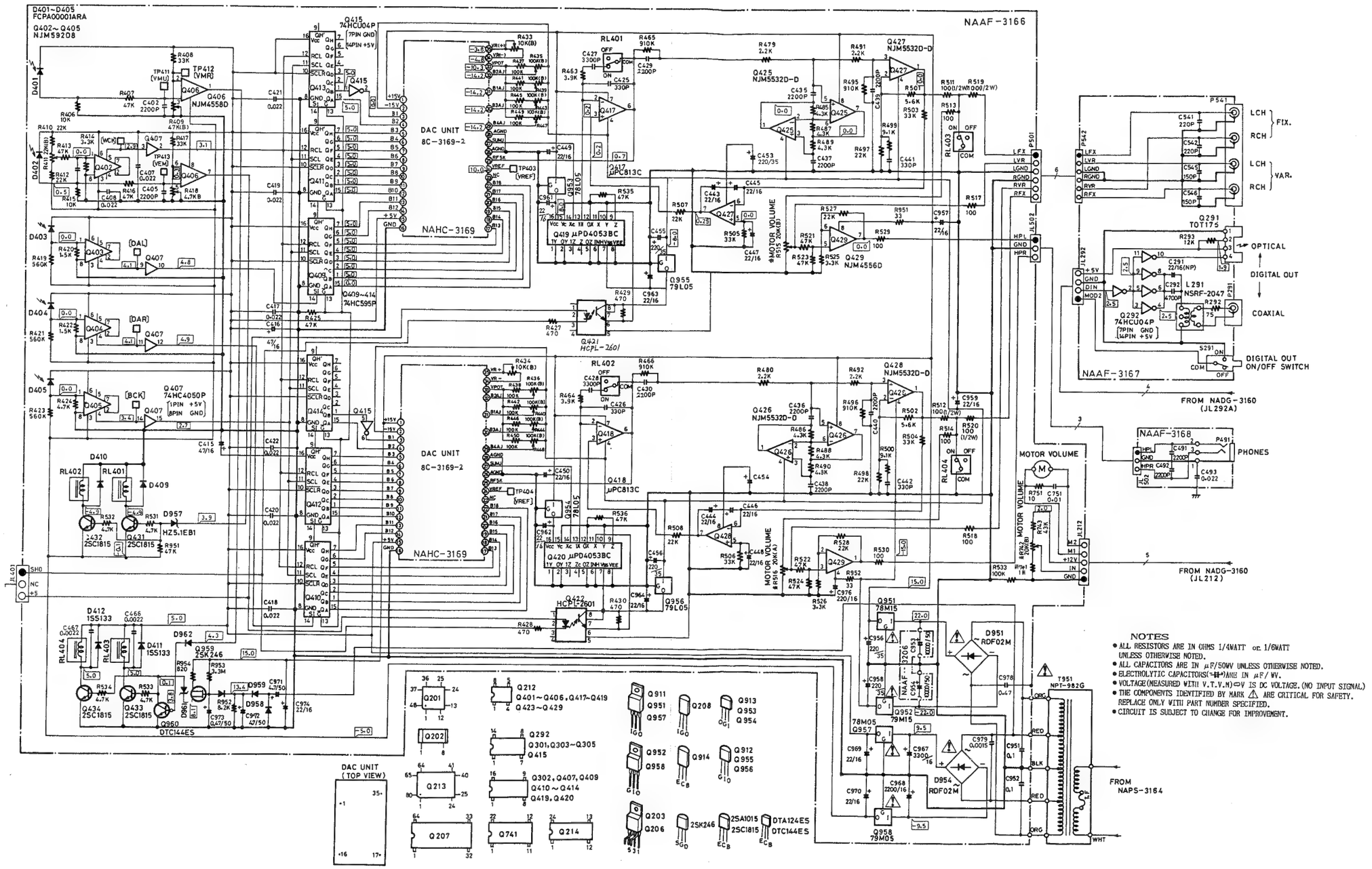
SCHEMATIC DIAGRAM



— NOTES —

- ALL RESISTORS ARE IN OHMS 1/4WATTS or 1/6WATTS UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF/50WV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS(=##=)ARE IN μF/ WV.
- ALL DIODES ARE 1SS133 UNLESS OTHERWISE NOTED.
- VOLTAGE(MEASURED WISH V.T.V.M)=V IS DC VOLTAGE.(NO INPUT SIGNAL)
- THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR SAFETY. REPLACE ONLY WITH PART NUMBER SPECIFIED.
- CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT.

SCHEMATIC DIAGRAM



NOTES

- ALL RESISTORS ARE IN OHMS 1/4WATT or 1/6WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF/50WV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS(−⊕+)ARE IN μF/WV.
- VOLTAGE(MEASURED WITH V.T.V.M)⇨V IS DC VOLTAGE.(NO INPUT SIGNAL)
- THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR SAFETY. REPLACE ONLY WITH PART NUMBER SPECIFIED.
- CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT.

WAVEFORM OF EACH SECTION

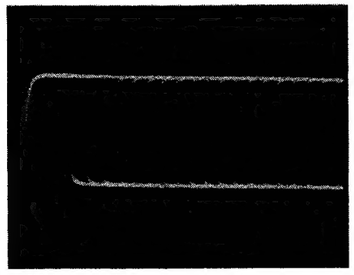


Photo 1
EFM signal
Vertical:1V/div.
Holizontal:5 μs/div.
Insert the resistor 2.2kohm between probe of oscilloscope and test point.

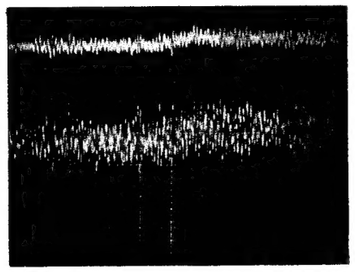


Photo 2
Focus signal
Upper P201
Lower FO(T.P)
Vertical:0.2V/div.
Holizontal:5ms/div.

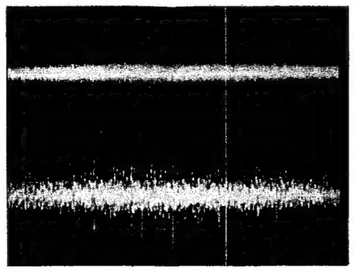


Photo 3
Tracking signal
Upper P201
Lower TR(T.P)
Vertical:1V/div.
Holizontal:5ms/div.

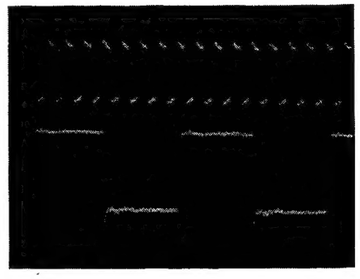


Photo 4
Upper OSC output Pin 3 of Q302
Lower BCLK signal Pin 5 of Q302
Vertical:2V/div.
Holizontal:0.1 μs/div.

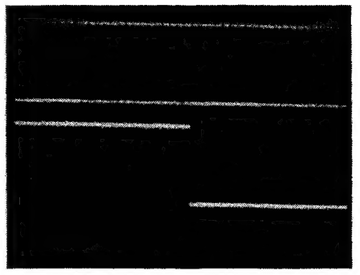


Photo 5
Upper DATA signal Pin 7 of Q302
Lower LRCK signal Pin 5 of Q302
Vertical:2V/div.
Holizontal:5 μs/div.

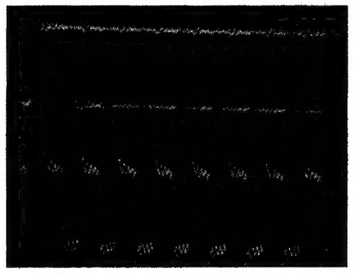


Photo 6
Upper DLO signal Pin 3 of Q305
Lower DCO signal Pin 10 of Q303
Vertical:2V/div.
Holizontal:0.1 μs/div.

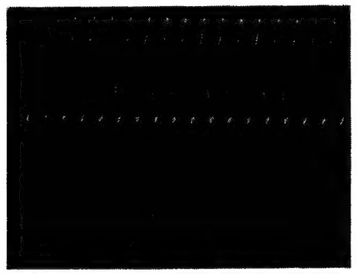


Photo 7
X'tal osc. output Pin 1 of Q301
Vertical:1V/div.
Holizontal:0.1 μs/div.

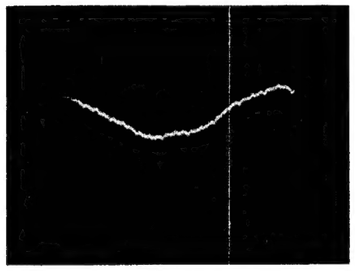


Photo 8
SLD signal(T.P) When play
Vertical:1V/div.
Holizontal:20ms/div.

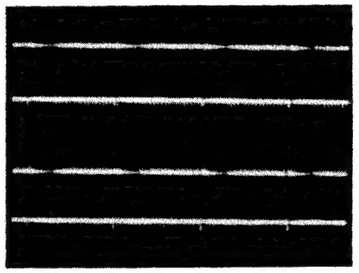


Photo 9
Upper DAL signal(T.P)
Lower DAR signal(T.P)
Vertical:2V/div.
Holizontal:2 μs/div.

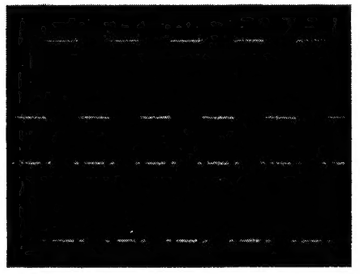


Photo 10
Serial/Parallel change
Pins 1 & 15 of Q413
Vertical:2V/div.
Holizontal:0.5ms/div.

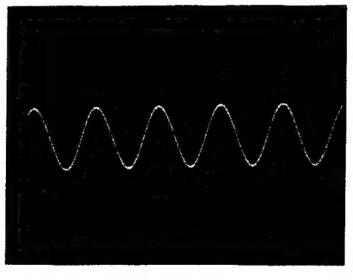


Photo 11
Audio output
Pins 6 of Q417 & Q418
Vertical:5V/div.
Holizontal:0.5ms/div.

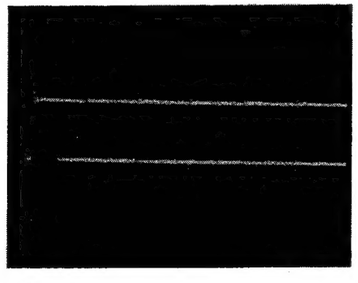


Photo 12
Digital output
Vertical:20mV/div.
Holizontal:0.2 μs/div.

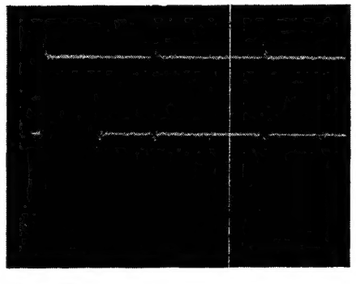


Photo 13
Digital opto. output
Vertical:2V/div.
Holizontal:0.1 μs/div.

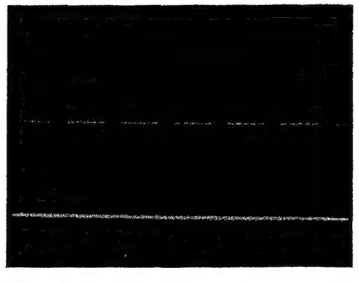
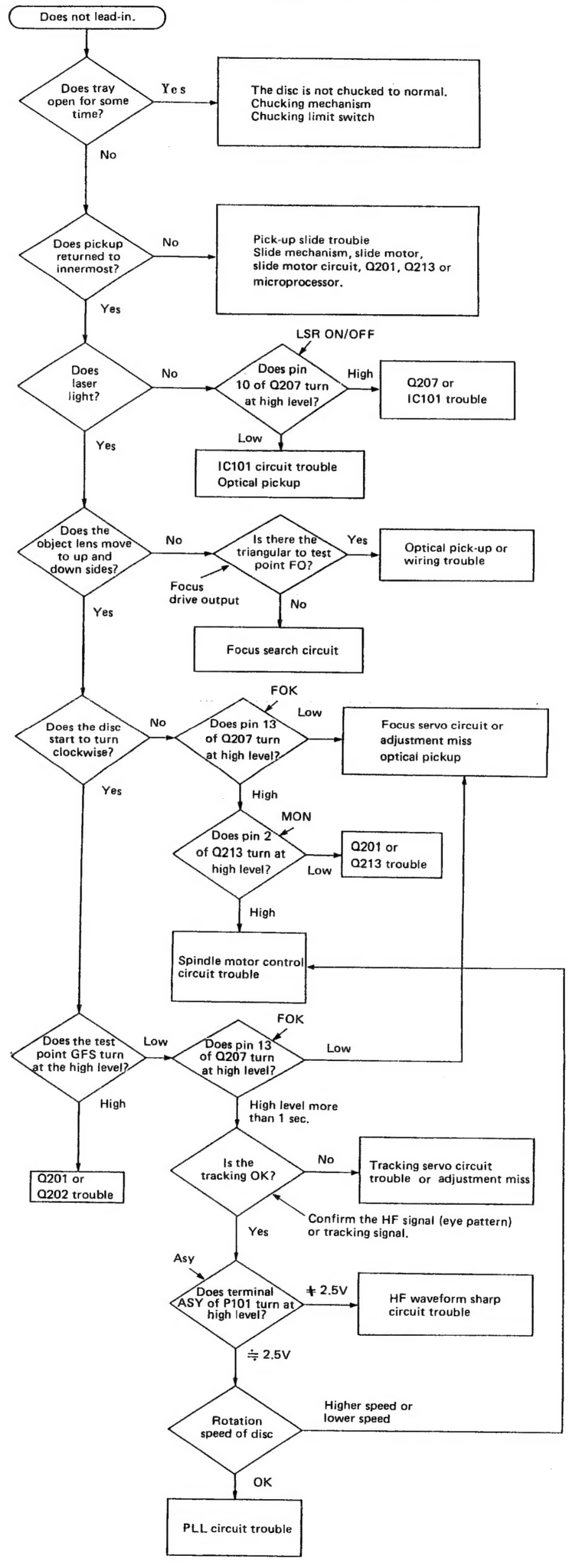


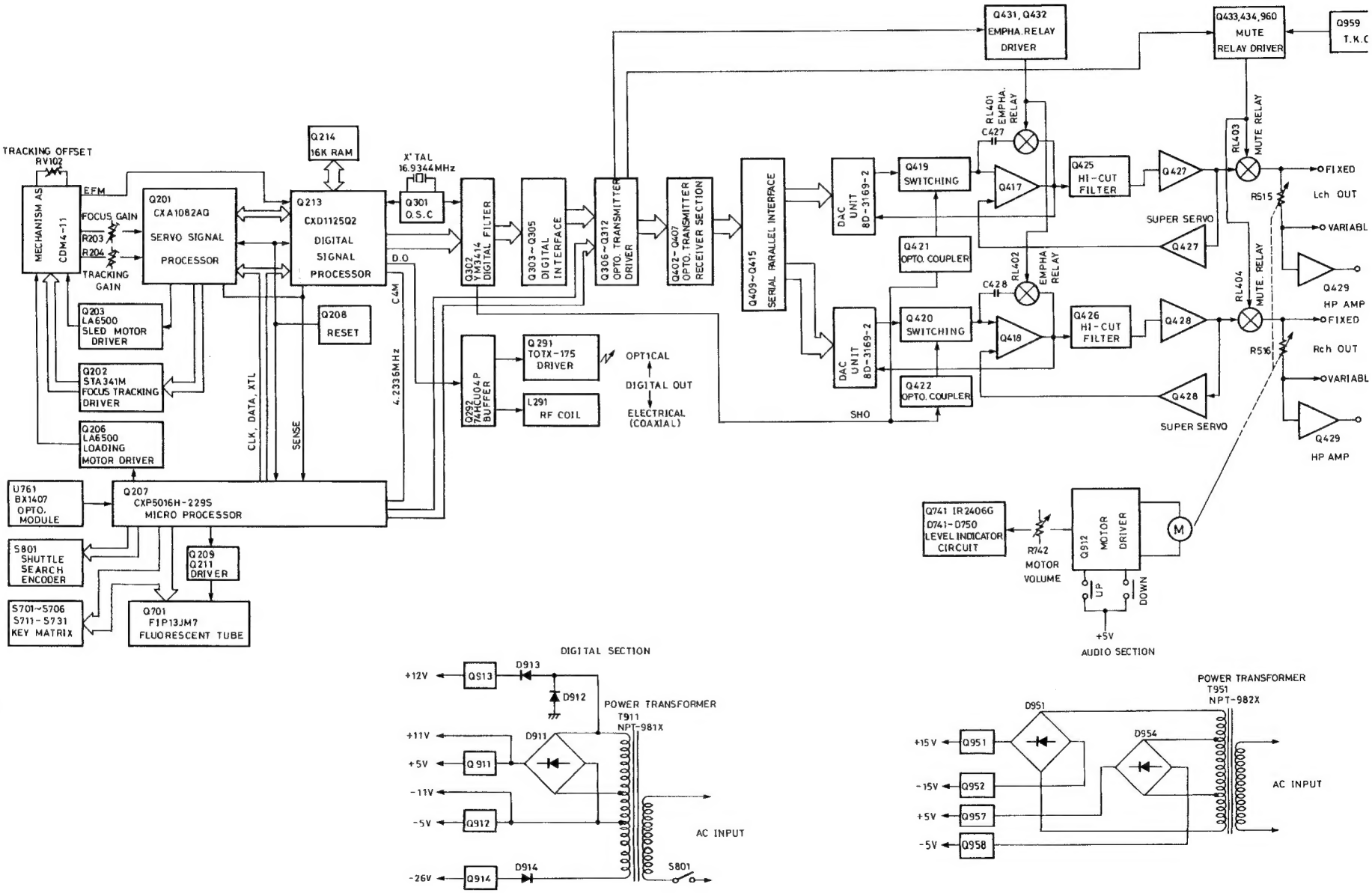
Photo 14
Grid signal of FL tube(Pin 50 of Q207)
Vertical:10mV/div.
Holizontal:1ms/div.

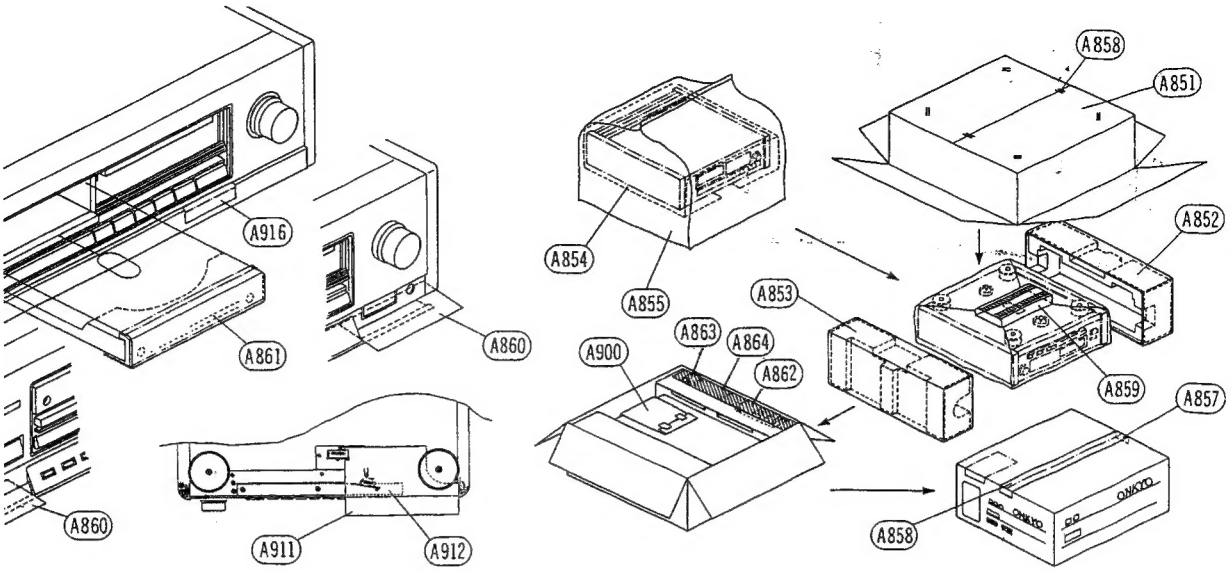
NOTE:Play the track 2 of test disc.(YEDS-18)

TROUBLESHOOTING GUIDE

Load the disc on the tray, press OPEN/CLOSE key and close the tray. But, the total time and total number of tunes are not indicated on the fluorescent indicator tube.




TRACKING OFFSET
RV102
MECHANISM AS CDM4-11
EFM
FOCUS GAIN
R203
R204
TRACKING GAIN
Q201 CXA1082AQ SERVO SIGNAL PROCESSOR
Q213 CXD1125Q2 DIGITAL SIGNAL PROCESSOR
Q214 16K RAM
X'TAL 16.9344MHz
Q301 O.S.C
Q302 YM3414 DIGITAL FILTER
Q303~Q305 DIGITAL INTERFACE
Q306~Q312 OPTO. TRANSMITTER DRIVER
Q402~Q407 OPTO. TRANSMITTER RECEIVER SECTION
Q409~Q415 SERIAL PARALLEL INTERFACE
Q203 LA6500 SLED MOTOR DRIVER
Q208 RESET
Q202 STA341M FOCUS TRACKING DRIVER
Q206 LA6500 LOADING MOTOR DRIVER
CLK, DATA, XTL
SENSE
C4M
4.2336MHz
D.O
Q292 74HCU04P BUFFER
Q291 TOTX-175 DRIVER
L291 RF COIL
OPTICAL
DIGITAL OUT
ELECTRICAL (COAXIAL)
SHO
U761 BX1407 OPTO. MODULE
Q207 CXP5016H-229S MICRO PROCESSOR
S801 SHUTTLE SEARCH ENCODER
S701~S706 S711~S731 KEY MATRIX
Q209 Q211 DRIVER
Q701 F1P13JM7 FLUORESCENT TUBE
Q431, Q432 EMPHA. RELAY DRIVER
Q433,434,960 MUTE RELAY DRIVER
Q959 T.K.C
RL401 EMPHA. RELAY
C427
RL403 MUTE RELAY
DAC UNIT 8D-3169-2
Q419 SWITCHING
Q417
Q425 HI-CUT FILTER
Q427
SUPER SERVO
Q421 OPTO. COUPLER
RL402 EMPHA RELAY
C428
RL404 MUTE. RELAY
Q420 SWITCHING
Q418
Q426 HI-CUT FILTER
Q428
Q422 OPTO. COUPLER
RS15
RS16
FIXED
Lch OUT
VARIABL
Q429 HP AMP
Rch OUT
Q741 IR2406G D741~D750 LEVEL INDICATOR CIRCUIT
R742 MOTOR VOLUME
Q912 MOTOR DRIVER
UP
DOWN
+5V
AUDIO SECTION
DIGITAL SECTION
+12V
Q913
D912
POWER TRANSFORMER T911 NPT-981X
+11V
D911
+5V
Q911
-11V
-5V
Q912
AC INPUT
-26V
Q914
D914
S801
POWER TRANSFORMER T951 NPT-982X
D951
D954
+15V
Q951
-15V
Q952
+5V
Q957
-5V
Q958
AC INPUT



PART NO.	DESCRIPTION
29051712	Master carton box
29091232	Pad L
29091231	Pad R
29095508	600×1300,Protection sheet
29100038A	720×950,Poly-vinyl bag
260012	Damplon tape
282301	Sealing hook
29091230	Pad
29095509	70×120,Protection sheets
29355142	Caution sheet
24140015	RC-112C,Remote control unit
3010054	UM-3,Two batteries
260013	Damplon tape
29355143	Caution label
27141167	Bracket ST
34230102	3TTS+10B(Ni),Nickel screw

REF.NO.	PART NO.	DESCRIPTION
A912	29361029	Label,bottom
A916	29355144	Caution label,door
A900	Accessary bag ass'y	
	2010166	Connection cord
	29341278	Instruction manual
	2050005	Opto. code
	24509395A	Single adaptor
	9100006A	350×250,Poly-vinyl bag
	29365020	Warranty card
	29100094A	Poly-vinyl bag for warranty card

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